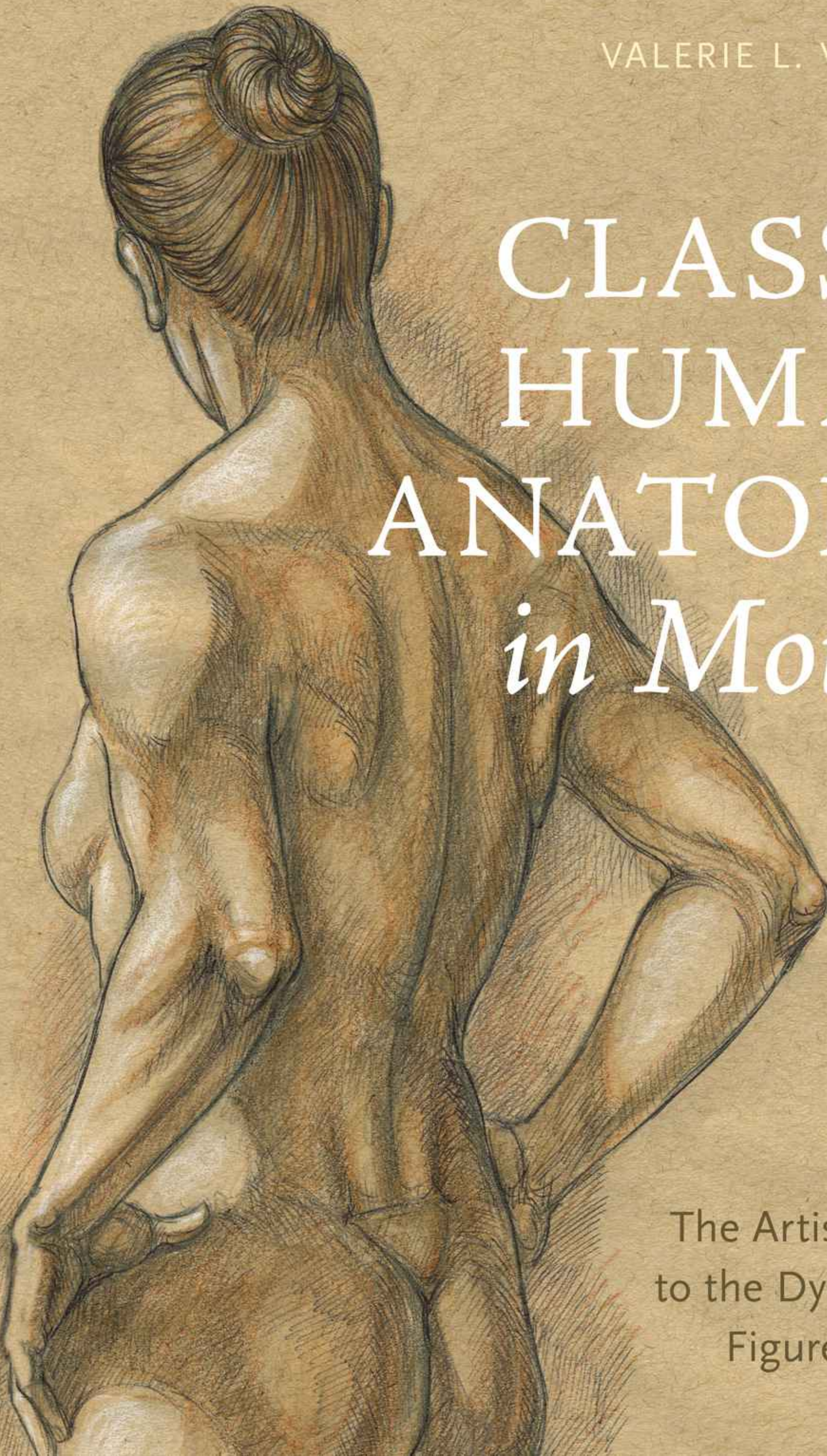
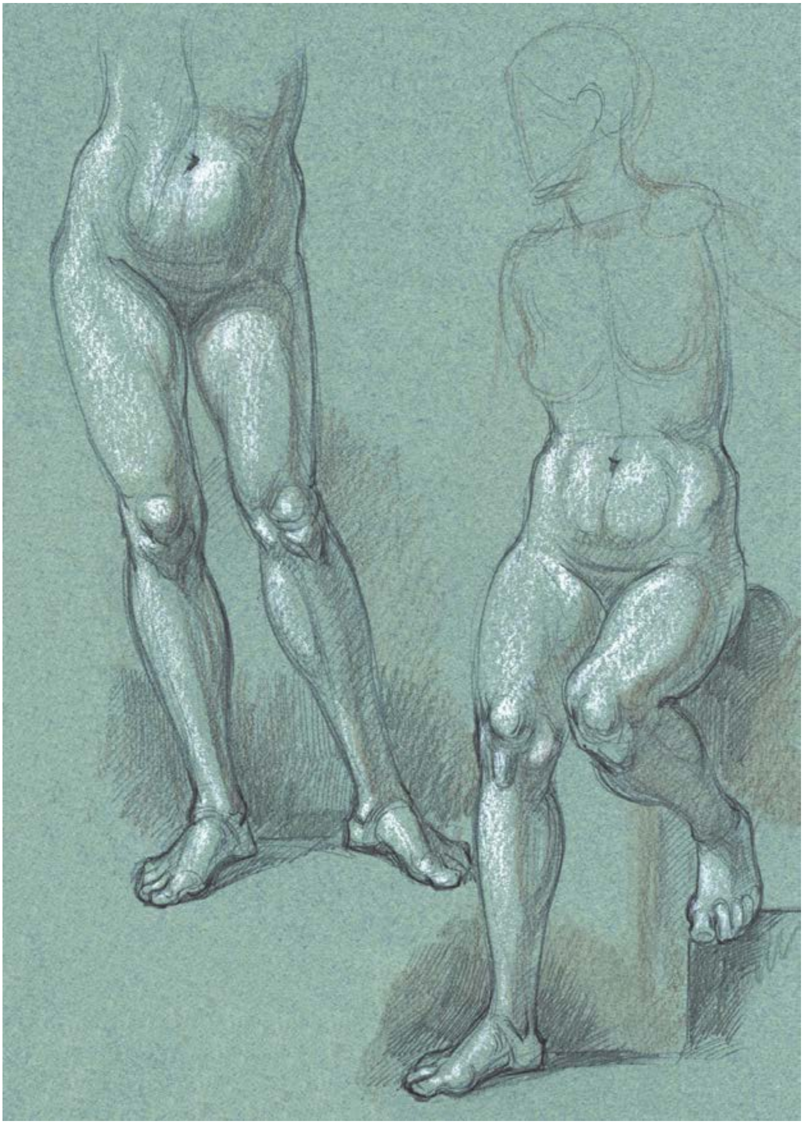
VALERIE L. WINSLOW

CLASSIC HUMAN ANATOMY *in Motion*



The Artist's Guide to the Dynamics of Figure Drawing



STUDY OF TWO PAIR OF LEGS

Ballpoint pen, colored pencil, white chalk on toned paper.

CLASSIC HUMAN ANATOMY *in Motion*

The Artist's Guide to the Dynamics of Figure Drawing

VALERIE L. WINSLOW

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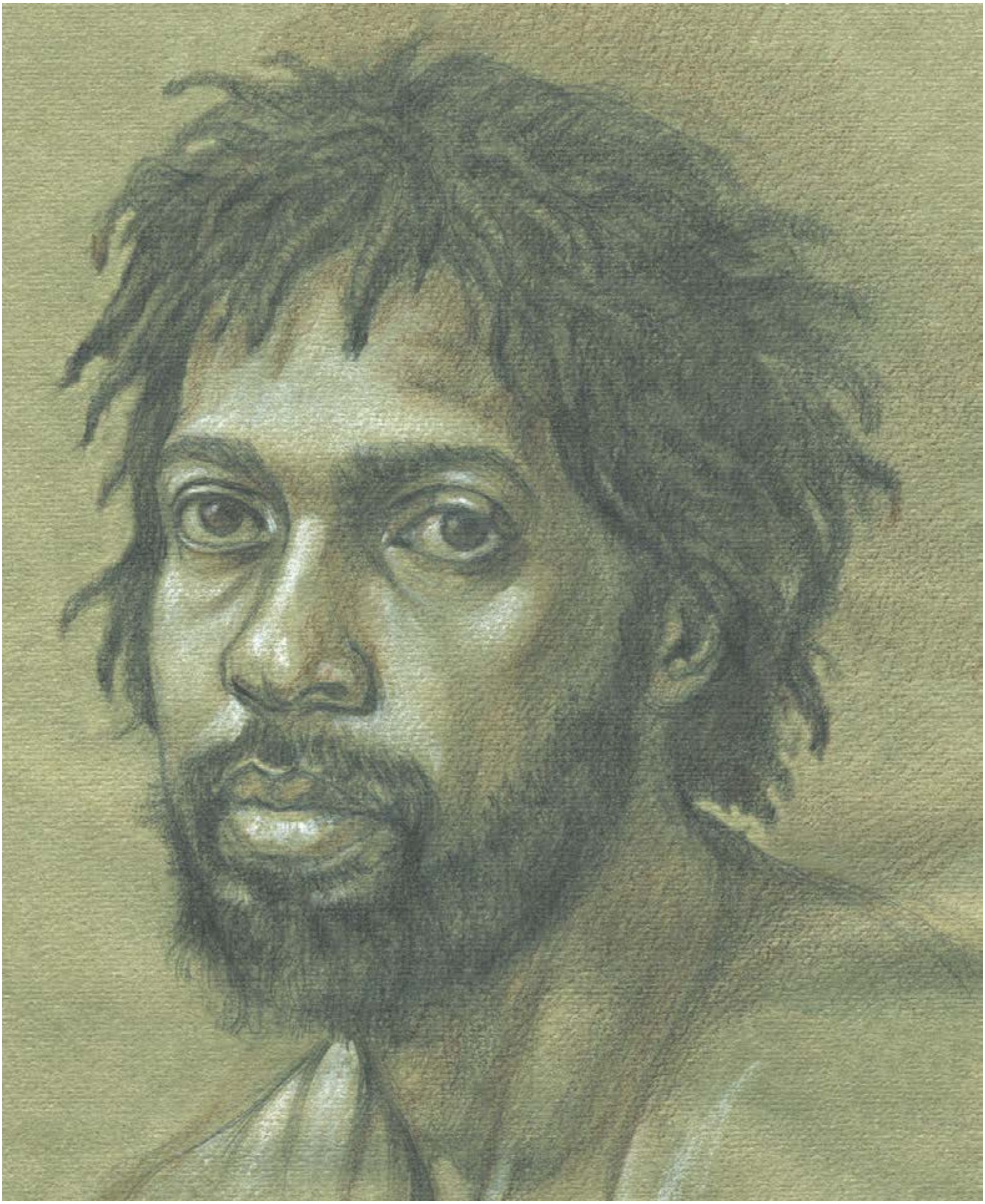

STUDY OF OTEINO AS A YOUNG MAN

Graphite pencil, colored pencil, white chalk on toned paper.

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PREFACE

From the beginning of my artistic pursuits, I’ve always felt strongly that the study of anatomy is vital for understanding the human figure. This was the main reason I was attracted to artistic anatomy—though I admit that I was also eager to take on the challenge of learning such a difficult subject. But as a teacher of figurative art, I realize that many artists are intimidated by anatomy’s sometimes overwhelming complexity. And so I feel the responsibility to pass on to others the knowledge that I have gained, and to present the anatomical material in an accurate yet easy-to-understand format accessible to any artist who needs or wants the information. That was the motive for writing my first book, *Classic Human Anatomy,* and it remains the motive for this new book, *Classic Human Anatomy in Motion.*

The English philosopher Francis Bacon said, “Knowledge is power,” and that’s certainly true for artists: Understanding something well gives an artist more power to create what he or she wants to create. Over the years, I’ve often known figurative artists who wanted to take their art in certain creative directions but who kept hitting a dead end because they didn’t really understand the basic anatomical elements of the human form. Then, when they acquired this knowledge—to whatever degree they felt was sufficient—their figurative work was transformed. For an artist, anatomical knowledge shouldn’t be an end in itself. Instead, it should inspire and enhance an artist’s creative work. When artists take the guesswork out of anatomy and truly understand the body’s structures and mechanisms, they can open up to a more intuitive level when solving certain problems in their figurative work.

Back when I was starting my art training, it was hard to find a course in artistic anatomy. Anatomy classes had been phased out of most art school and art department curriculums in the United States. The change started in the mid-twentieth century, when abstract expressionism and then pop art, conceptualism, and minimalism became the primary focus in art schools, replacing older artistic traditions. Yes, there were still ateliers that offered anatomy classes, but very few. I myself was scoffed at by teachers and other artists for trying to obtain knowledge of anatomy. They told me the subject was antiquated, too complicated, no longer necessary, and that I was wasting my time pursuing such an outdated topic.

This hostile attitude, however, ignited a rebellious desire on my part, and I continued, as best I could, to study the human figure in the classical way. I began collecting as many artistic and medical anatomy books as I could find, and I started a rigorous routine of

reading the material and passionately drawing from live models to make all that information come alive in my work. I found that understanding the dynamics of form, structure, and movement gave my drawings and paintings an aesthetic edge. I wasn't just "reporting" bio-mechanical information; I was using that information to enhance my art and take it to another level.

I was also grilling doctors and medical anatomists with questions whenever I met them. Opportunities opened up for me to draw and study from human cadavers, and this significantly increased my knowledge of how muscles and bones connect three-dimensionally. I realize that some people might consider the viewing of a dissected body to be morbid, disrespectful, or even sacrilegious. But for me, those sneak peeks beneath the surface of the skin into a usually inaccessible realm ignited a primal sense of wonderment. I found it miraculous that the body's trillions of parts—from the macroscopic down to the subcellular level—all work harmoniously together in a synchronized system. The study of cadavers was a tremendous gift, allowing me to fully appreciate how anatomical forms interconnect and how the skeletal and muscular systems influence the body's surface forms. Drawing from cadavers gave me a much fuller understanding of what I was seeing when I drew from living models.

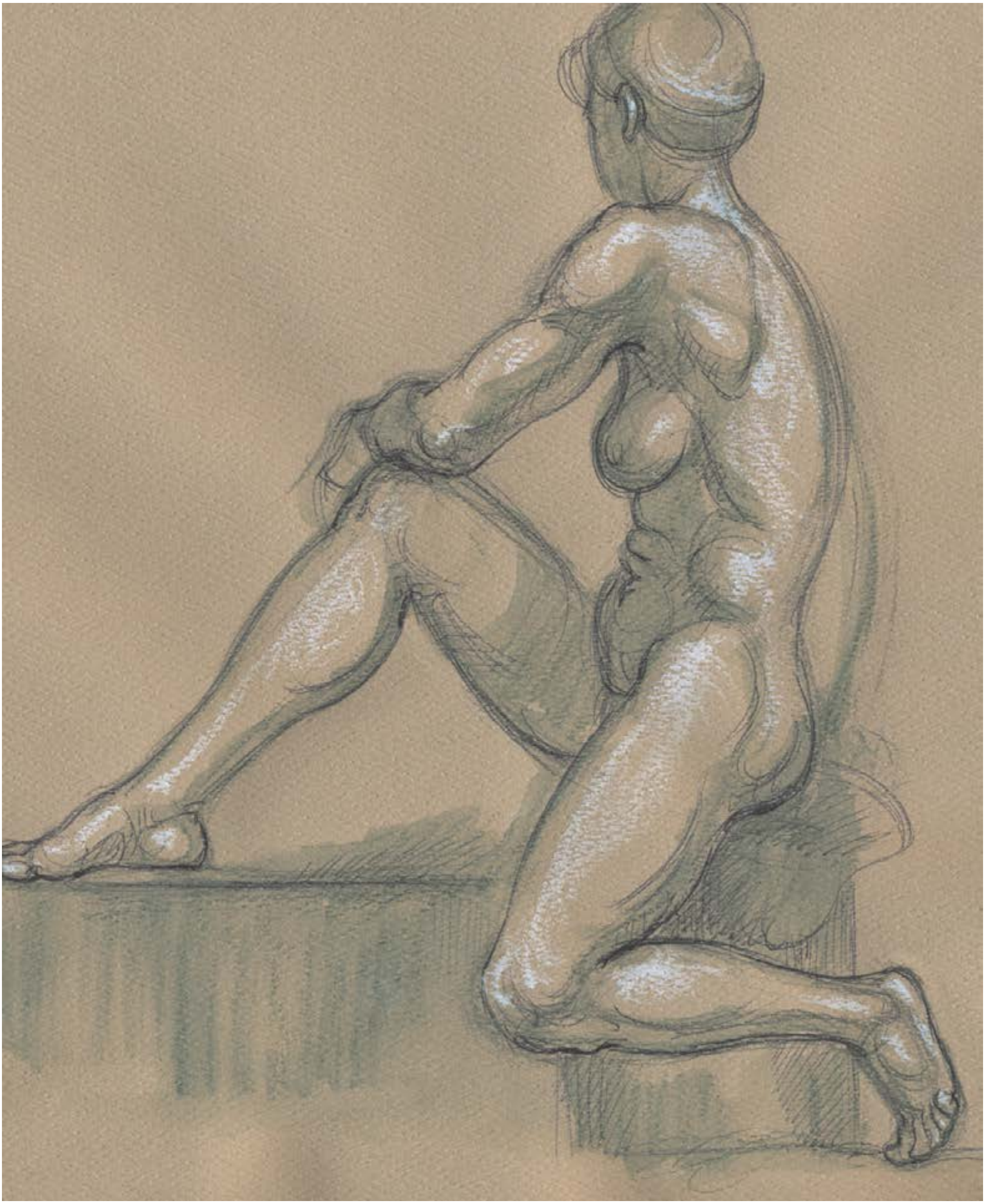
Then, in the late 1970s, while in my twenties, I was offered the opportunity to teach figurative art. I jumped at the chance to introduce artistic anatomy to my students, since no other drawing teacher seemed to talk much about it. My students reacted with enthusiasm, and it was astonishing to see this change in attitude of young art students toward artistic anatomy. I was also noticing that new books on artistic anatomy were being published, and that the "oldies but goodies" books by Andrew Loomis, Paul Richer, and Stephen Rogers Peck were once again in high demand—and were even being reissued in new editions. Over the years, my students had often encouraged me to write my own book, and so I decided to take on that challenge, as well.

When *Classic Human Anatomy* was published in 2009, I thought my goal was accomplished. I was aching to get back into the studio and work nonstop on my paintings once again. After several months of painting and exhibiting my work in galleries, I finally began to file away the piles of anatomy books, research notes, manuscript pages, life drawings, diagrams, and skeleton bones that were still cluttering my studio. But in the process of doing that, I realized there was quite a lot of material that I hadn't been able to fit into *Classic Human Anatomy.* So I contacted my publisher and asked if they would be interested in a companion book, one that would focus on the anatomy of the human figure in motion. When they said yes, off I went, creating new drawings and diagrams and—like a crazed squirrel—digging deep for any buried nuggets of information that I felt might be beneficial for figurative artists.

Since the publication of *Classic Human Anatomy,* I've been touched by the response from people all over the world—not just artists but people in medical professions, as

well—who’ve written to tell me how much my book has inspired them. And I couldn’t be more pleased that the book is now considered a preferred anatomical reference book for artists. It is my sincere hope that *Classic Human Anatomy in Motion,* in addition to providing solid information, will likewise inspire artists as they continue their own unique creative journeys into the magical realm of the amazing and remarkable human figure.

VALERIE L. WINSLOW
Santa Rosa, California, 2015



STUDY OF A FEMALE FIGURE SITTING ON BENCH, SIDE VIEW

Ballpoint pen, watercolor wash, white chalk on toned paper.

INTRODUCTION

Anatomical Forms and Movement

The portrayal of the human figure has gone through numerous transformations over the last few thousand years. Just by taking a stroll through a museum, leafing through an art history textbook, or searching the Internet, you can witness firsthand the incredible variety of such depictions.

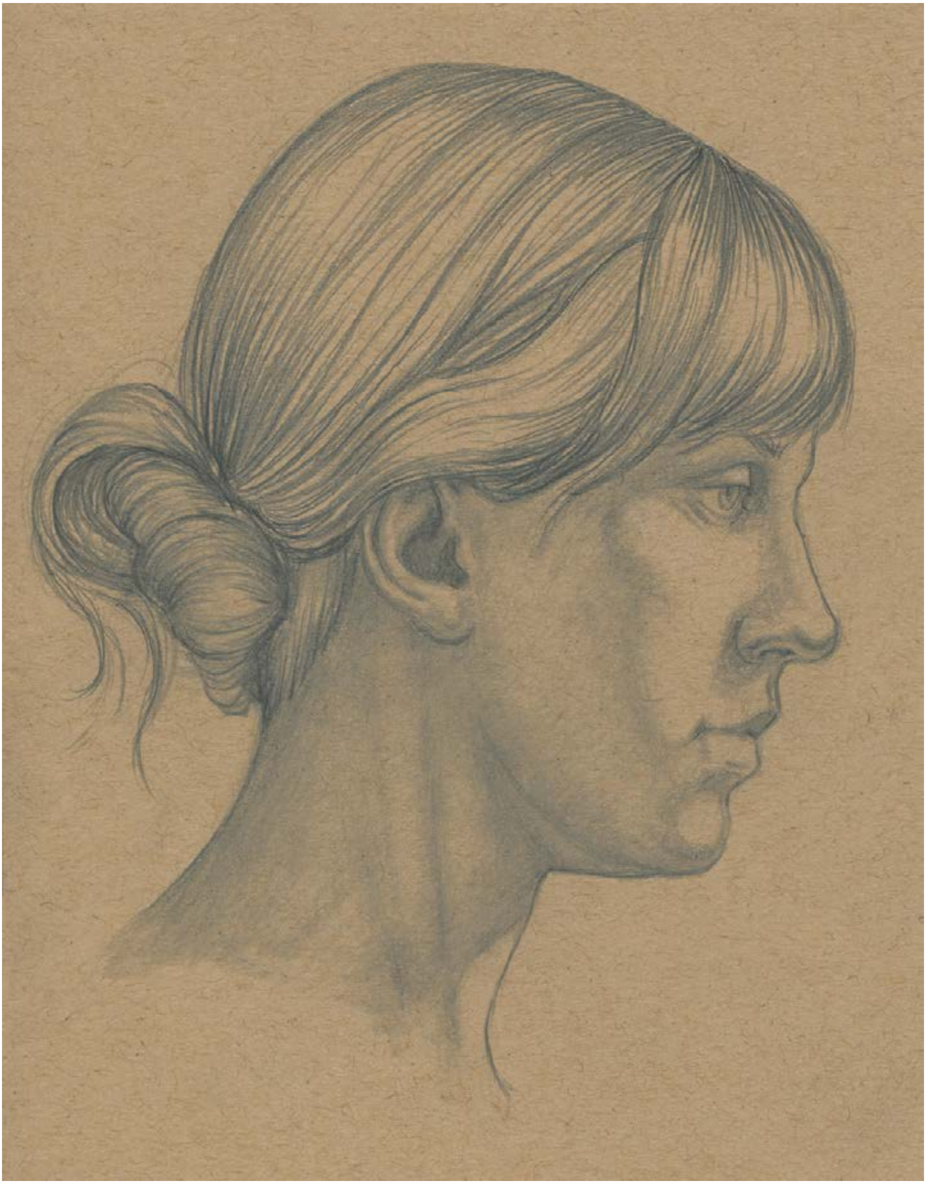
Moreover, most people are still captivated by the realistically depicted figures of Greco-Roman art, the Renaissance, the Baroque and Neoclassical periods, nineteenth-century academic art, and the revival of classical realism in the late twentieth century. Training for budding artists of the past included artistic anatomy as a required discipline, enabling them to fully comprehend what goes on beneath the skin and to portray the human figure in a convincing manner. But by the early twentieth century, classical realism had lost its footing. A new generation of artists had grown tired of the traditional manner of creating art and chose to investigate new and different approaches.

As always, however, the pendulum swings back. Some artists nowadays have an insatiable desire to reinvestigate the traditional aspects of figurative art. This new surge of interest can be gauged by the many classical ateliers sprouting up in various parts of North America and Europe, and by the fact that some art schools and art departments are again offering artistic anatomy as part of their curriculum. Galleries and museums are exhibiting contemporary classical figurative artists more frequently, and the digital film and gaming industries are creating demand for artists who possess the anatomical knowledge needed to create computer-animated figures. Once again, anatomy has become an essential part of an artist's training.

The subject, however, seems to perplex most artists at the beginning of their artistic anatomy training. One reason I wrote my first book, *Classic Human Anatomy,* was to help demystify this complex material. My intention was to provide simplified yet medically accurate descriptions of the various anatomical structures and to help artists learn anatomical terminology by including the Latin or Greek origins of anatomical names, their synonyms, and their pronunciations, presented phonetically. The book also contained origin and insertion diagrams for each muscle and many descriptions and depictions of muscle movement, as well as a large, in-depth glossary.

This new book, a companion to the first, is intended to create a bridge between the

anatomical material and the organic quality of the living model. Written in an artist-friendly style, it is illustrated with hundreds of drawings, including many life studies (from both quick and longer poses) and charts and diagrams showing the various anatomical and structural components. I divide the book into thirteen chapters, each one focusing on a different aspect of anatomical structures or a way to infuse a sense of vitality throughout the drawn forms.



PROFILE STUDY OF A YOUNG WOMAN

Graphite pencil on toned paper.

The general theme throughout the book is movement. But one cannot fully understand movement without a fundamental awareness of the anatomical forms, and so this book addresses the characteristics of bones, the mechanics of joints, and the location of

various muscle groups as a preliminary step to examining movement per se. Toward the end of the book, the study of movement is introduced from two different approaches: (1) conveying a sense of movement within depictions of stationary figures, and (2) depicting actual figurative movement.

Chapter 1 explores the primary bones—their locations and their surface landmarks. Bones provide the framework to which the muscles attach, so learning about the bones and their placement in the human form is the first step toward understanding how the body moves.

Chapter 2 focuses on the various joints and their movement. To fully understand movement, artists need to become familiar with the mechanics of the joints—their limitations as well as their capabilities. This knowledge is especially helpful for animators.

Chapter 3 introduces the basic traits of the skeletal muscles, their general locations in the body, how they attach to bones, and how they maneuver the joints when they contract. Tendons are also introduced, with a focus on their characteristics and how they influence the surface form.

Chapters 4, 5, 6, and 7 present more detailed information on, respectively, the muscles of the head and neck, the torso, and the upper and lower limbs, including the hands and feet. For the most part, I group muscles according to their region or function, for easier learning. Life studies are often accompanied by diagrams showing the muscular breakdowns of the poses.

Chapter 8 probes beneath the skin to see how the subcutaneous layer—which is positioned over the muscular layer—greatly influences the overall surface of the body. This chapter introduces body types, as well as the various surface form landmarks—the eminences, depressions, furrows, and folds that are observable throughout the body. The influence of fatty tissue on the surface form is also discussed.

Chapter 9 explores the structure of poses, demonstrating various ways to set up the preliminary armature, or framework, of a figure before adding the detail of the anatomical forms. Working with structures is a valuable tool for artists who work from memory or imagination. The planes of the figure—the geometric breakdown of the surface forms—are introduced at the end of the chapter.

Chapter 10 presents different approaches to gesture drawing. Gesture-drawing techniques give artists the ability to indicate the action of a pose very quickly. A list of pros and cons reveals the advantages and disadvantages of various ways of practicing gesture drawing.

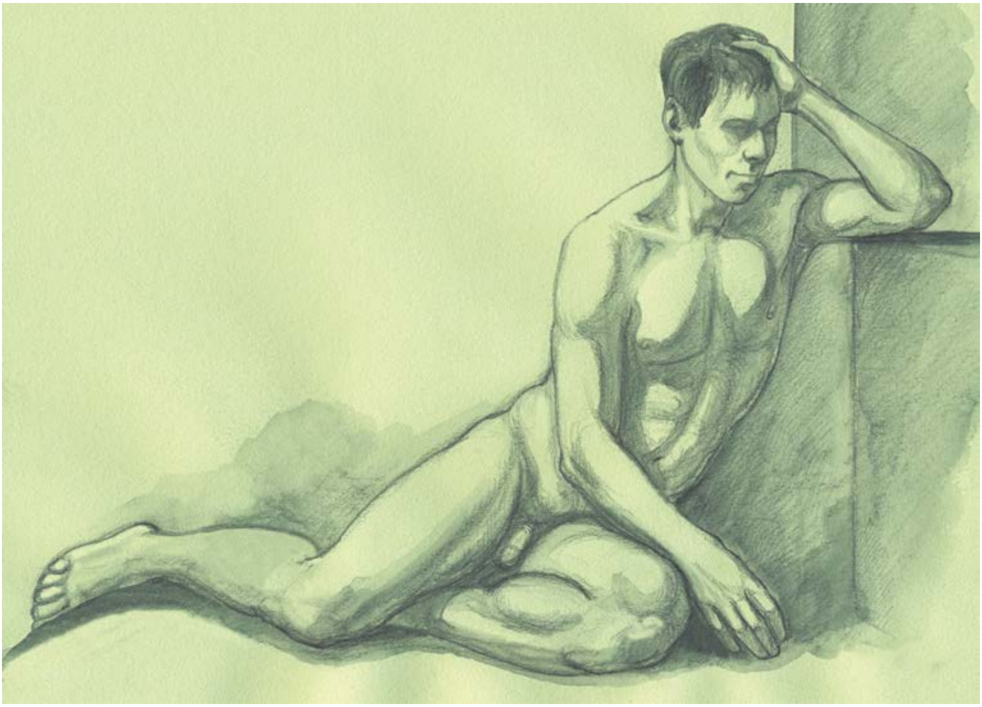
Chapter 11 explores ways of recognizing indications of movement—subtle or dynamic—within stationary poses, looking at turning, tilting, tipping, and twisting actions in the head, torso, and full figure. The axes of movement are discussed, as are two types of contrapposta poses—traditional and dynamic. Finally, the chapter examines how to find

the line of action within a pose.

STUDY OF A MALE FIGURE TWISTING WITH ARMS REACHING TOWARD THE RIGHT

Graphite pencil, ballpoint pen, watercolor wash, white chalk on toned paper

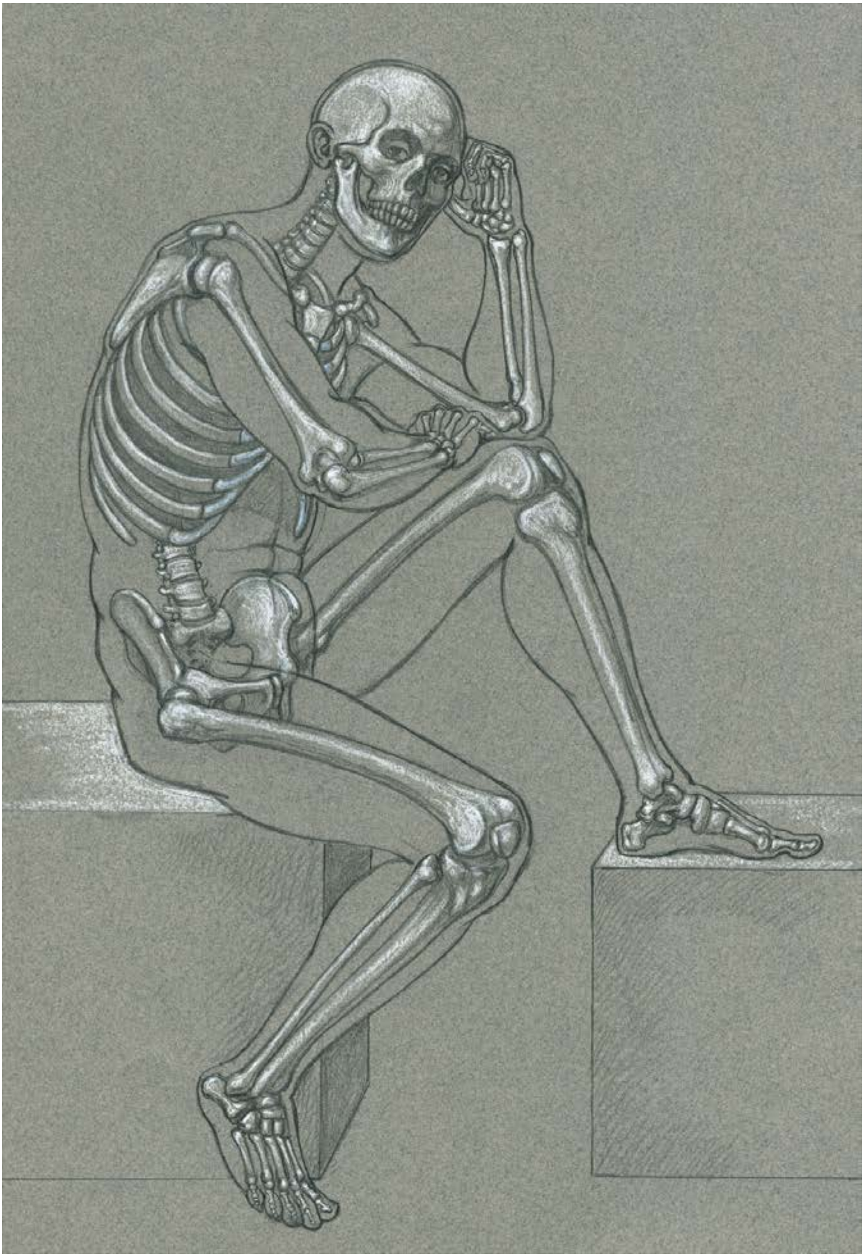
Chapter 12 investigates ways of conveying a sense of rhythmic movement within the forms of a drawn figure, giving the elements of a composition—forms, shapes, tones, etc.—a sense of continuity and interconnection.



STUDY OF MALE FIGURE SITTING ON FLOOR

Graphite pencil, ballpoint pen, watercolor pencil wash on toned paper.

The book's last chapter, Chapter 13, provides a basic introduction to the mechanics of walking and running, followed by a series of exercises for studying actual moving figures. These are not meant to be authentic animation techniques, but merely ways for artists working in all genres to strengthen their figurative skills through the practice of drawing figures in motion.



SITTING SKELETAL FIGURE

Graphite pencil and white chalk on toned paper.

Chapter 1

Bones and Surface Landmarks

There are many ways to approach the study of the human figure in motion. One great way to start is to gain a good grasp of the human skeletal system. In this chapter, we will look at the primary bones—their locations and their basic landmarks. Understanding the basic shapes and placement of bones serves many purposes for the artist. First, bones provide the framework to which the muscles are attached. Second, the lengths of the bones, particularly the long bones, help indicate the general proportions of a person (short, average, or tall stature). Third, portions of bones located close to the surface of the skin can be utilized as essential landmarks in the depiction of the human figure. Finally, bones' interactions at the joints—which we will cover extensively in the next chapter—are vital for understanding the mechanics of movement.

Bones are classified into four categories—*long bones* (bones of the limbs), *short bones* (carpal and tarsal bones of the wrist and foot), *flat bones* (sternum, ribs), and *irregular bones* (vertebrae, portions of cranial bones). The characteristics of these different types will be introduced as we examine the various bones of the skeleton.

Anatomy Vocabulary Basics

A number of essential anatomical terms are used repeatedly throughout this book. The first with which you should become familiar is *the anatomical position*—the standard international reference position used to locate the various sections and structures of the human body. The anatomical position is a standing, erect position of the entire body, with both feet on the ground next to each other and the head facing forward. The arms are positioned at the sides with the palms facing forward.

Other terms describe the locations of the various body parts (including bones and muscles) *in relation to one another when the figure is standing in the anatomical position*. Some of these terms are also used to describe the particular view that an observer has of the figure or a particular body part. Here is a basic list:

- *Anterior* means "in front of"—that is, toward the front of the body. An *anterior view* is a view of the front of the body or a body part.
- *Posterior* means "in back of"—that is, toward the back of the body. A posterior view is a view of the back of the body or a body part.
- *Lateral* means "side"—that is, away from the midline (or central axis) of the body. A *lateral view* is a side view of the body or a body part.

- *Medial* means "middle"—that is, toward the midline (or central axis) of the body. A *medial view* is a view of the medial surface of a body part (such as a foot).
- *Superior* means "above," referring to structures closer to the head or toward the top of a body part. A *superior view* is a view from above.
- *Inferior* means "below," referring to structures closer to the feet or toward the bottom of a body part. An *inferior view* is a view from below.
- *Dorsal* pertains to the back of the hand and the upper side of the foot.
- *Palmar* pertains to the palm of the hand.
- *Plantar* pertains to the sole of the foot.
- *Proximal* means "in proximity to"—that is, nearer a limb's point of origin on the torso. It can also pertain to structures of the fingers and toes.
- *Distal* means "distant from"—that is, farther from a limb's point of origin on the torso. It can also pertain to structures of the fingers and toes.

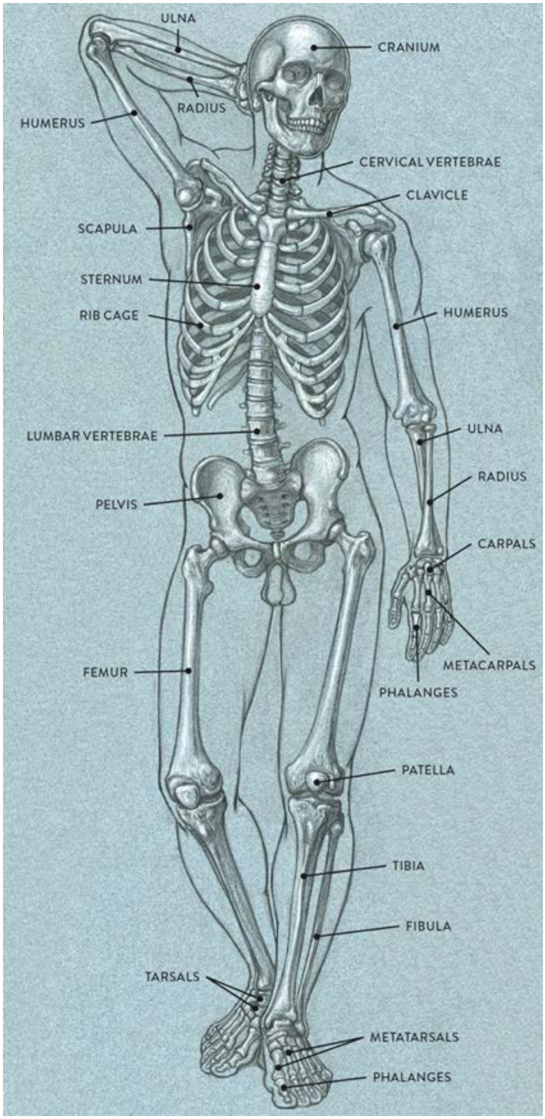
The Main Bones of the Human Figure

The human skeleton consists of two basic parts—the *axial skeleton* and the *appendicular skeleton.* The axial skeleton is the group of bones that forms the central axis of the body; its primary function is to support and protect the internal organs. The bones of the axial skeleton include the cranium, the bones of the vertebral column (including the sacrum and coccyx), and the rib cage.

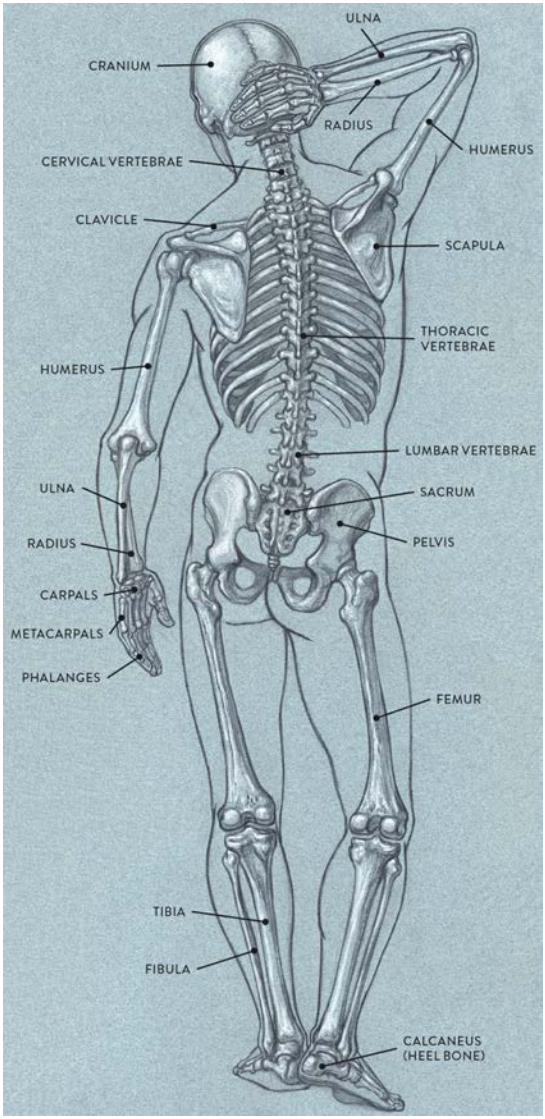
The appendicular skeleton is the group of bones forming the appendages of the body (upper and lower limbs), including the shoulder girdle and pelvic girdle. The primary functions of the appendicular skeleton are to support and move the axial skeleton and to allow movement of the limbs. Appendicular bones include the humerus, ulna, and radius of the upper limbs; the femur, tibia, and fibula of the lower limbs; the bones of the hands and feet; the scapula and clavicle; and the two hip bones (os coxae) of the pelvis.

The following two drawings show the basic bones and their locations, as seen from both anterior (front) and posterior (back) views of the figure. Learning the placement of the bones will help you identify the bony landmarks you may see as a live model takes various poses.

BASIC BONES OF THE SKELETON—ANTERIOR VIEW



BASIC BONES OF THE SKELETON—POSTERIOR VIEW

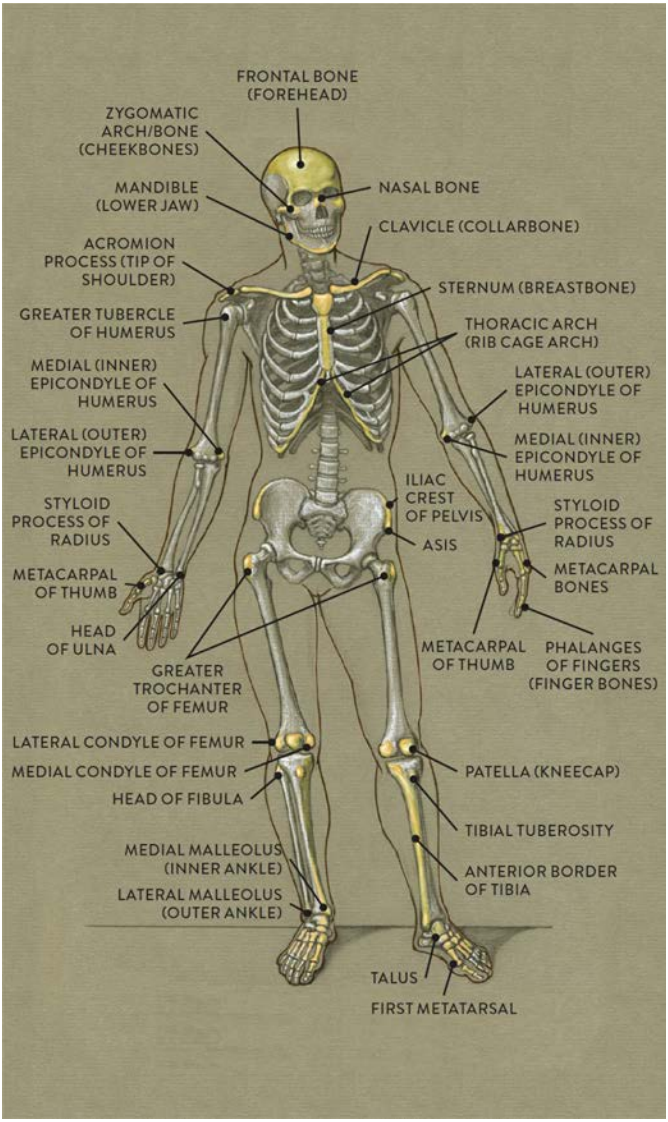


Bony Landmarks

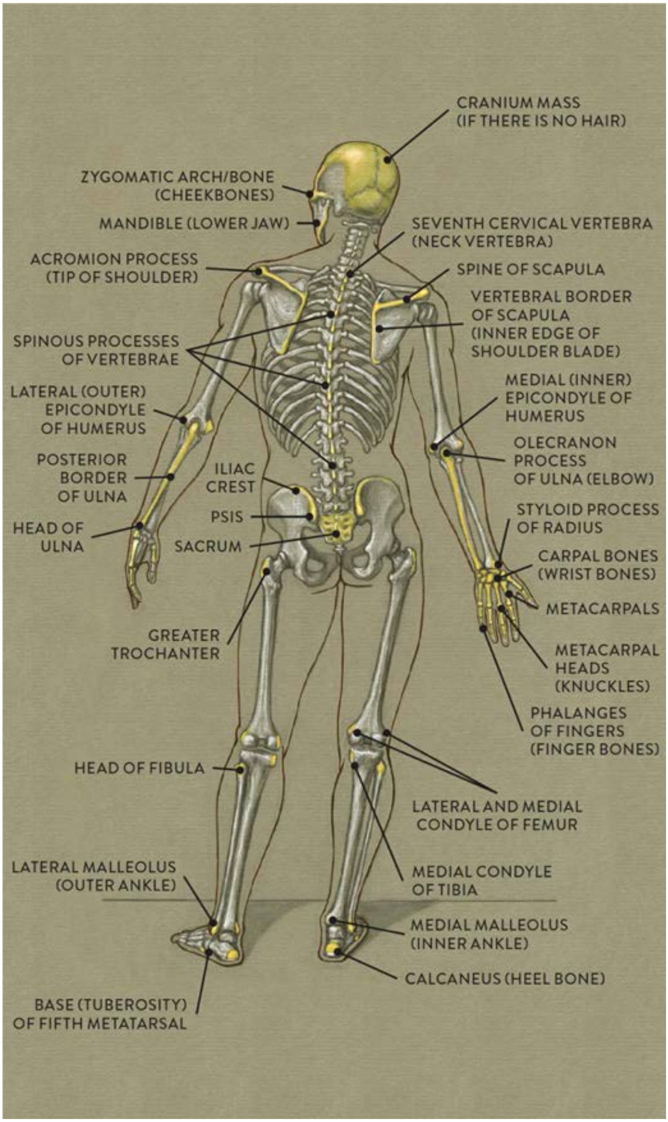
When drawing the human figure, artists look for various *surface landmarks.* These can be *soft surface forms,* such as muscles, tendons, ligaments, and fatty tissue, or *hard surface forms,* which are places where evidence of the skeleton can be seen on the surface of the body. Hard surface forms are also known as *bony landmarks*—parts of bones (ridges, bumps, depressions) that are positioned close to the skin, creating visual landmarks on the surface form.

The following drawings provide a general guide to where the main bony landmarks are, as seen from both the anterior and posterior views. Whether you can see these skeletal clues on a live model will depend on both the pose and the model's body type. On some figures, fatty tissue may obscure much of the evidence of the bones, while on leaner figures it will be easier to see bone definition at several places on their bodies.

BONY LANDMARKS OF THE SKELETON—POSTERIOR VIEW



BONY LANDMARKS OF THE SKELETON—ANTERIOR VIEW

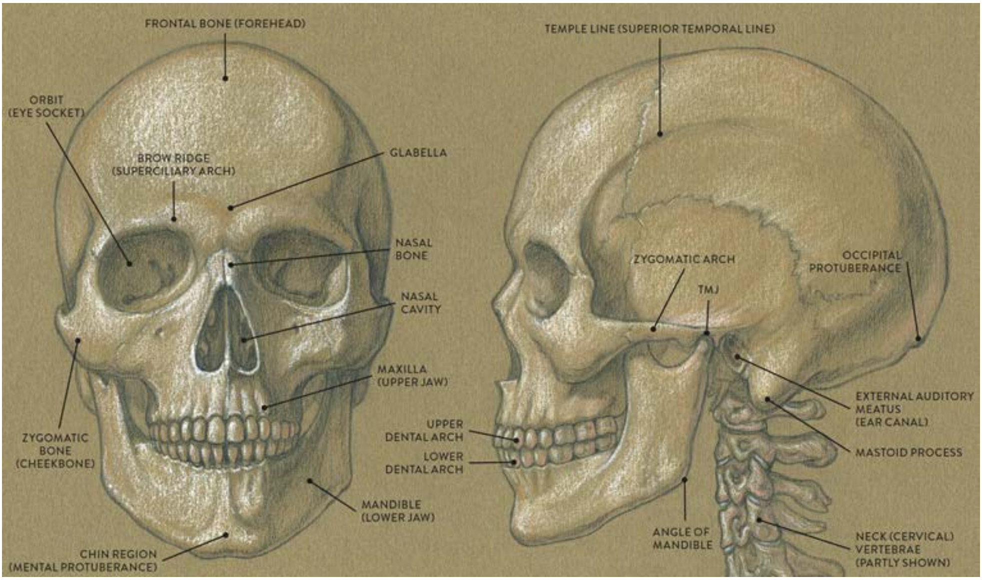


The Cranium

The *cranium,* or skull, consists of two portions: One portion, resembling an ostrich egg, houses the brain and creates the dome of the skull. This portion consists of eight separate bones that are fused together. The second portion contains fourteen individual *facial bones,* which are positioned in the front region of the cranium. The facial bones are also fused together, with the exception of the movable lower jawbone, which is called the *mandible.*

Variations in the many bony components of the cranium are remarkable from one person to another. The width of the cranium can range from very narrow to rather wide. When viewed from the side, a face can appear almost flat, or the profile can project out strongly. The forehead can be almost vertical, like a steep cliff, or can curve gracefully. Cheekbones can be prominent or hardly noticeable. The nose, depending on the projection of the nasal bone, can be flattish or pronounced. The mandible (lower jaw) can be small, with a delicate chin, or robust, with a broad chin. When drawing a face, it is always a good idea to look for these bony landmarks, as they play a large role in creating the individual's unique facial characteristics.

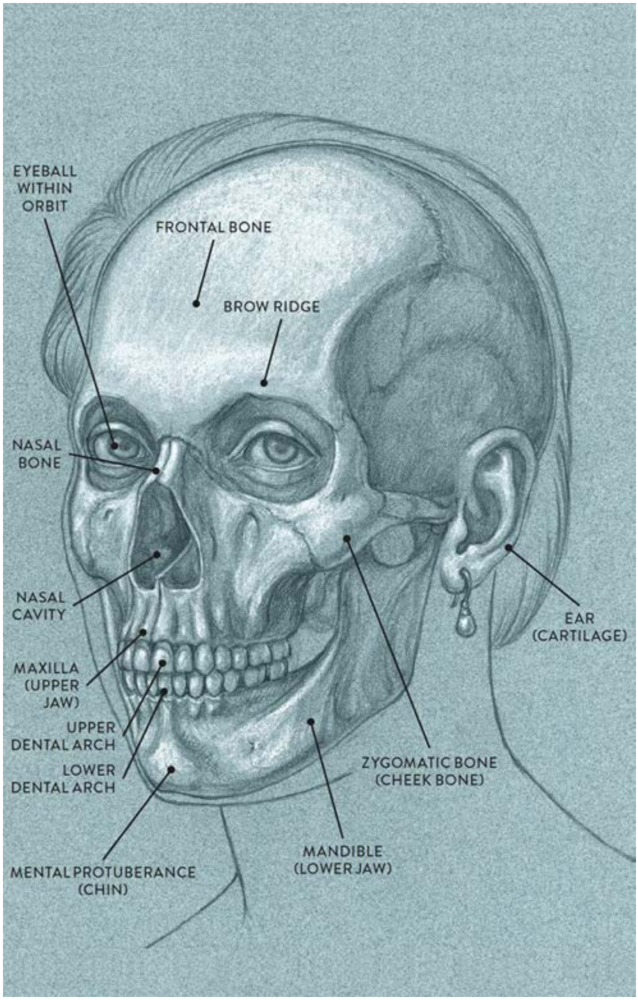
The following drawing shows the basic bones of the cranium. Many of the bones' features are covered by facial muscles, which are themselves obscured by a layer of subcutaneous fatty tissue. But knowing the placement of these bones will greatly help you understand where certain facial muscles or soft-tissue forms attach.



Anterior and lateral (side) views

In the next drawing, portions of a face have been superimposed over a three-quarter view of the cranium, showing how the eyes are contained within the eye sockets and how the cartilage of the ear is positioned.

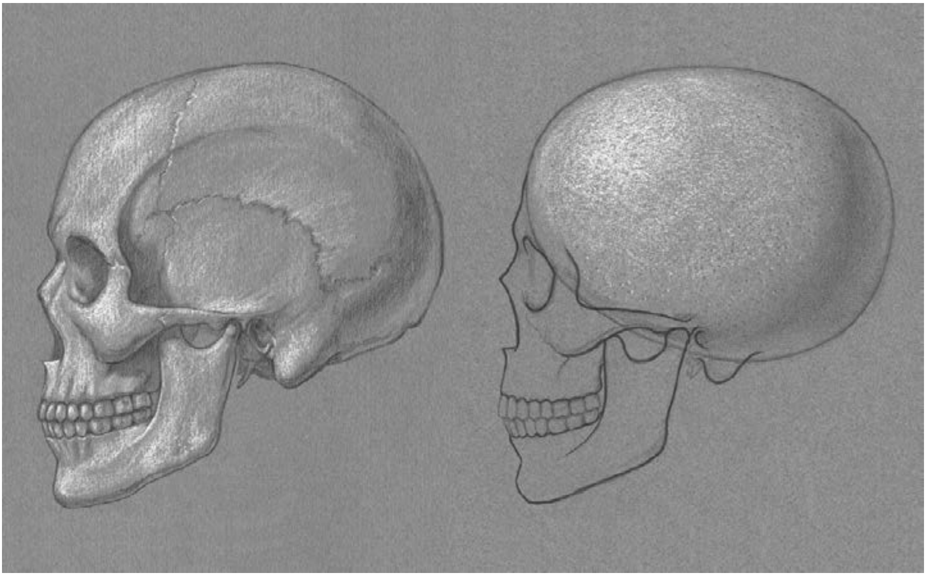
THE CRANIUM, WITH SOME FACIAL FEATURES SUPERIMPOSED



Anterior three-quarter view

The following drawing shows the profile of the cranium and, next to it, an ostrich egg with superimposed facial bones. When drawing a head in profile, it can be helpful to think of the braincase as an ostrich egg to avoid clipping the width of the cranium from front to back, which beginning artists tend to do. The width of the cranium will, of course, appear to lessen as the head rotates toward you.

THE BRAINCASE RESEMBLING AN OSTRICH EGG

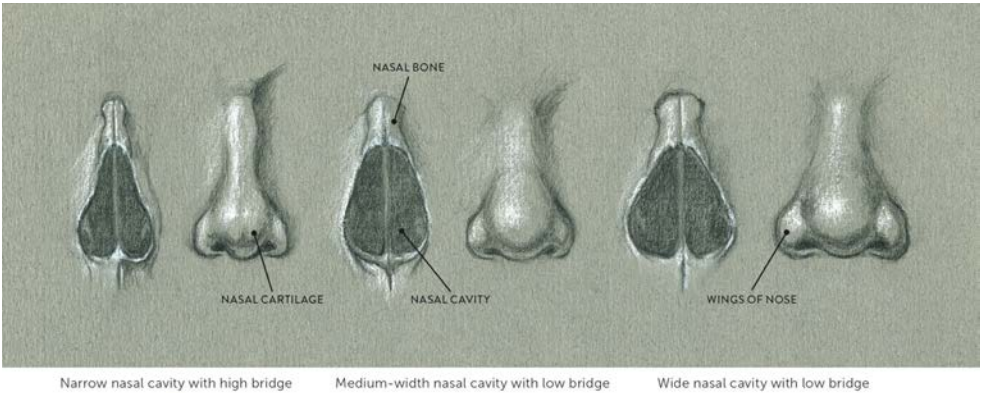


Now, let’s look at a few individual components of the cranium. The *frontal bone,* commonly called the forehead, is a bony plate situated at the upper front of the cranium above the eye sockets. It is similar in shape to the back of a crab, as shown in this drawing shown here. The outer borders, which are called the *temple lines* (*superior temporal lines*), are helpful in indicating the plane change that occurs from the front of the head to the side. The *brow ridge* (*superciliary arch*) is the slightly thickened portion above the eye sockets; males tend to have thicker brow ridges than females. The *glabella* is a smooth prominence above the root of the nose. The *frontal eminences* are two large, slightly bulging forms positioned side by side in the general forehead region. These eminences can be subtle or quite robust, depending on the individual.

The *eye sockets,* also called *orbits,* are two large bony hollows, each containing the sphere of the eyeball. Situated between the eye sockets is the area where the structure of the nose begins, commonly called the *root of the nose.* The nose is made up of a combination of bone and soft-tissue forms (cartilage). The bone segment, called the *nasal bone,* actually consists of two bones positioned side by side and forming the bony bridge of the nose. The nasal bone can be thought of as a bony canopy that protrudes over the nasal cavity and serves as an attachment site for the nasal cartilage and muscles. The *nasal cavity* is an inverted heart-shaped aperture that contains some of the sinuses. It is divided in half within by the nasal septum, which is a structure consisting of both bone and cartilage.

The endless variations in nose shapes are influenced by three components: the bridge of the nasal bone, the nasal cavity, and the cartilage that attaches to the bony part of the nose. If the nasal bone has a high bridge, the nose structure juts out more from the front

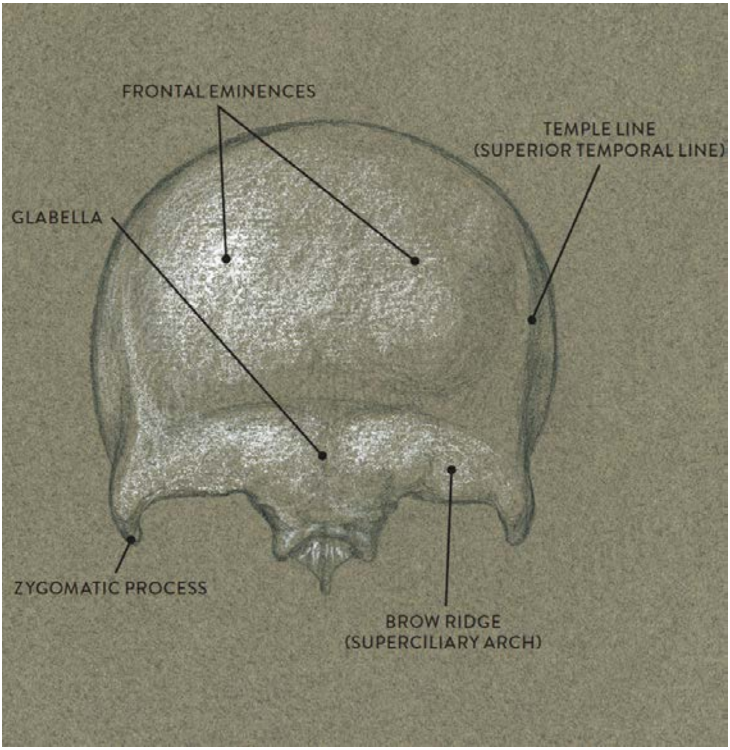
plane of the face, whereas a low bridge produces a flatter nose. A narrow nasal cavity produces a nose that is narrow and sometimes more angular, while a wider nasal cavity creates a broader nose. The drawing on the following page shows three basic shapes of the nasal bones and three basic widths of the nasal cavity. These bony features can affect the overall shape of the soft-tissue forms of the nose, which are the *nasal cartilage* (*lateral cartilage* and *greater alar cartilage*) and the *wings of the nose* (*lesser alar cartilage* and *fibrous fatty tissue*).



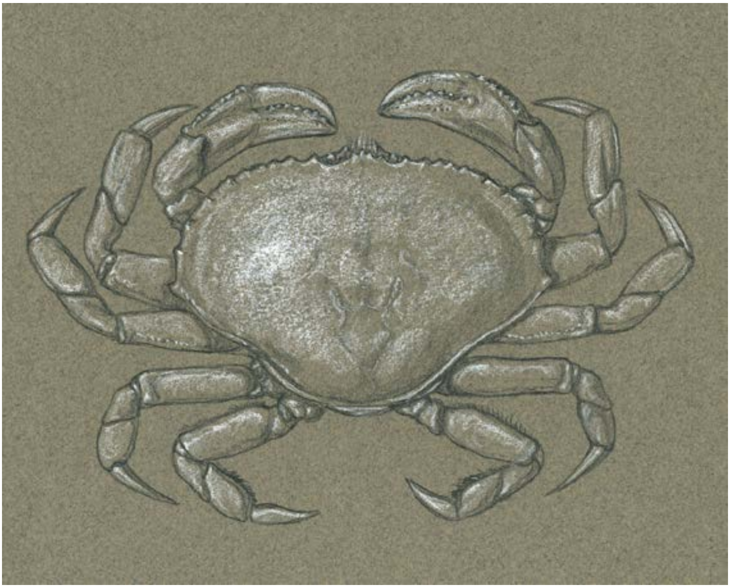
Anterior views of different noses

The *cheekbones,* called the *zygomatic bones* in anatomical terminology, are projections of bone near the lower, outer parts of the eye sockets. The cheekbone has two portions: the *zygomatic process,* which is part of the outer portion of the eye socket, and the *zygomatic arch,* which is a thin strip of bone (comprised of two sections) that continues along the side of the head toward the ear. The zygomatic bones mainly serve as an anchoring site for muscles. Many artists emphasize this bone by placing a rich highlight on the upper plane of the structure.

THE FRONTAL BONE RESEMBLING THE BACK OF A CRAB



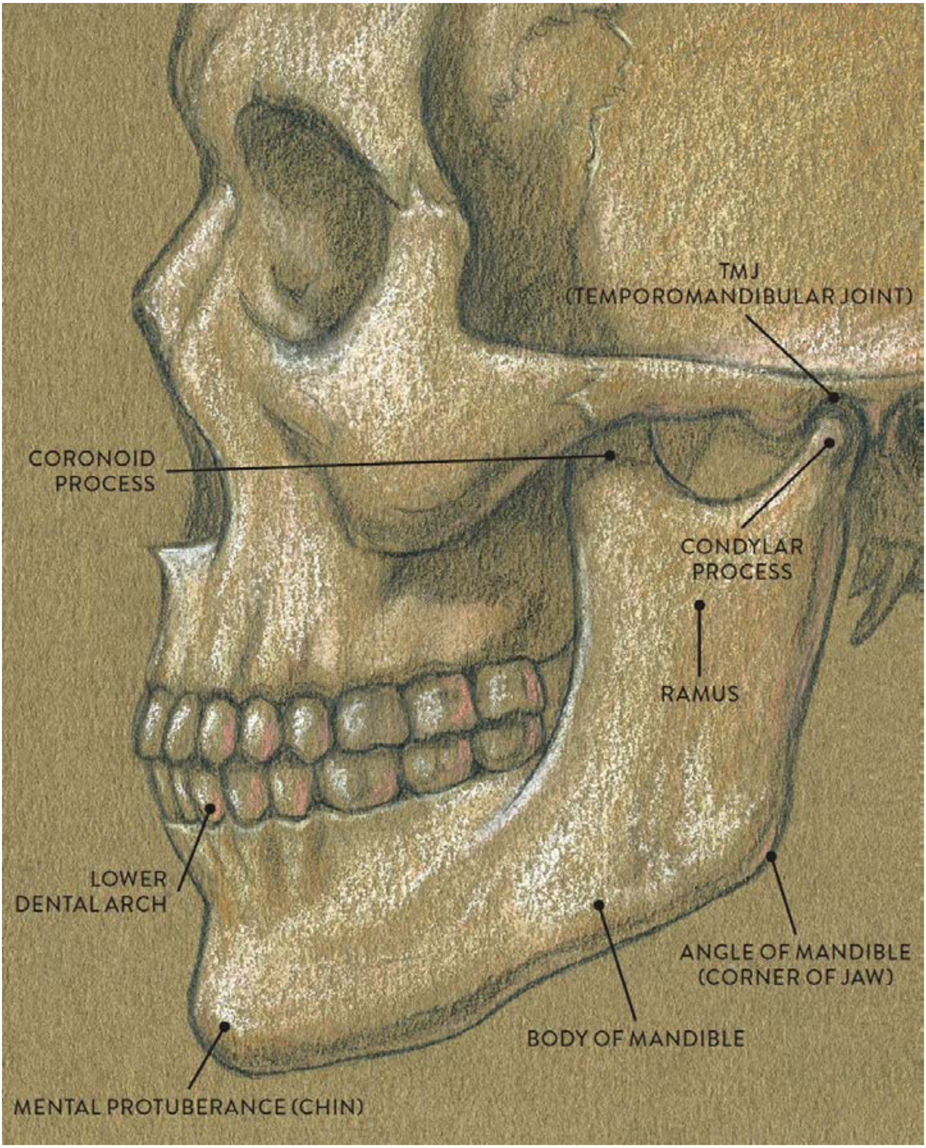
Frontal bone, anterior view



Dungeness crab (*Metacarcinus magister*)

The *maxilla* (upper jaw) is actually two joined bones that together form the upper dental arch and parts of the lower orbits (eye sockets), nasal cavity, and hard palate. The section containing the dental arch is U-shaped, which fits over the U-shaped dental arch of the mandible. The external portion of the maxilla bones is covered with muscles and subcutaneous fatty tissue, making it hard to detect on the surface. When observing some expressions of the mouth, such as a broad, toothy grin with parted lips, you will see the gums, which attach directly on the maxilla.

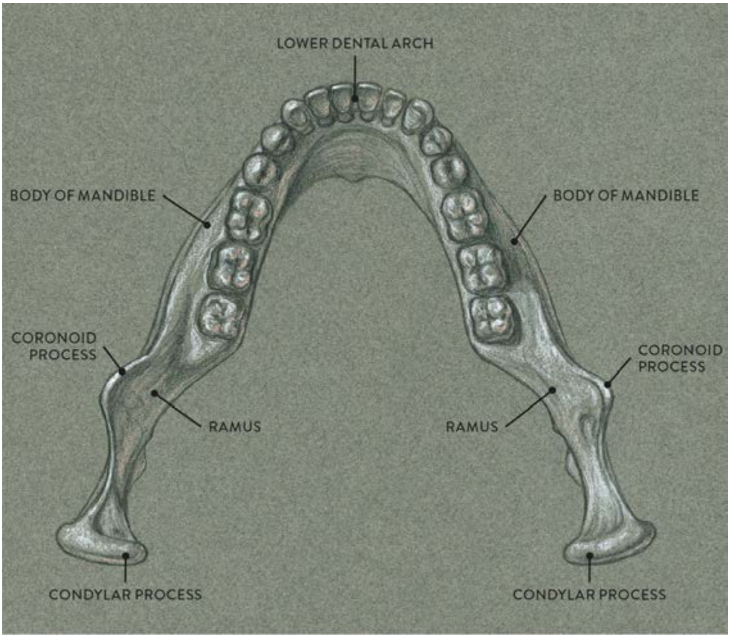
The *mandible* (lower jaw) is the only movable bone in the whole cranium. Overall, it is shaped much like a horseshoe, as shown in the lower drawing opposite. The *ramus* (pl., *rami*) extends upward from the body of the mandible, its shape rather flat and rectangular. At the upper part of the ramus on the side closest to the teeth is a shark-fin shape called the *coronoid process.* On the side of the ramus closest to the ear canal is a pronglike structure called the *condylar process.* This structure is part of the *temporomandibular joint,* or TMJ, the only moveable joint in the cranium.



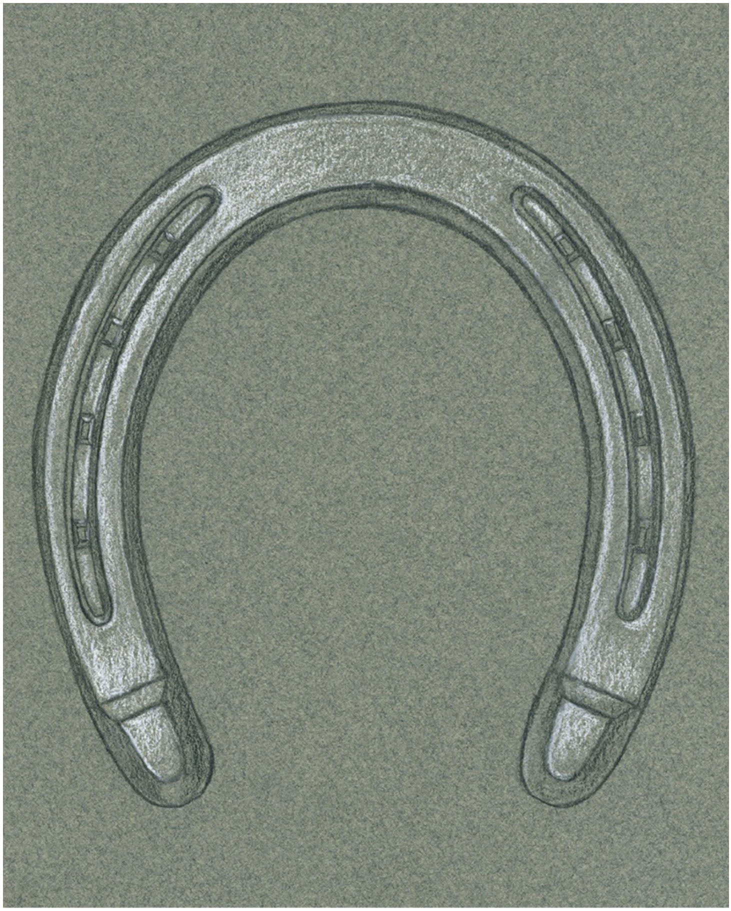
The outer edges of the mandible and the chin region give the only surface evidence of this bony structure when the jaw is closed, because the rest is covered by muscles and glandular and fatty tissues. There are two lines along the outer edge of the mandible: a shorter line that aligns with the ear and a longer one that sweeps into the chin region. The

angle of mandible is the corner where these two lines come together. Depending on how the soft-tissue forms attach to the jaw area, the outer edges of the mandible may be more angular or more smoothly curving. The chin area, referred to anatomically as the *mental protuberance,* is a bony mass covered with muscles that flesh out the actual chin shape. Chins can be wide or narrow and can recede back or project forward.

THE MANDIBLE RESEMBLING A HORSESHOE



Mandible, superior view



Horseshoe

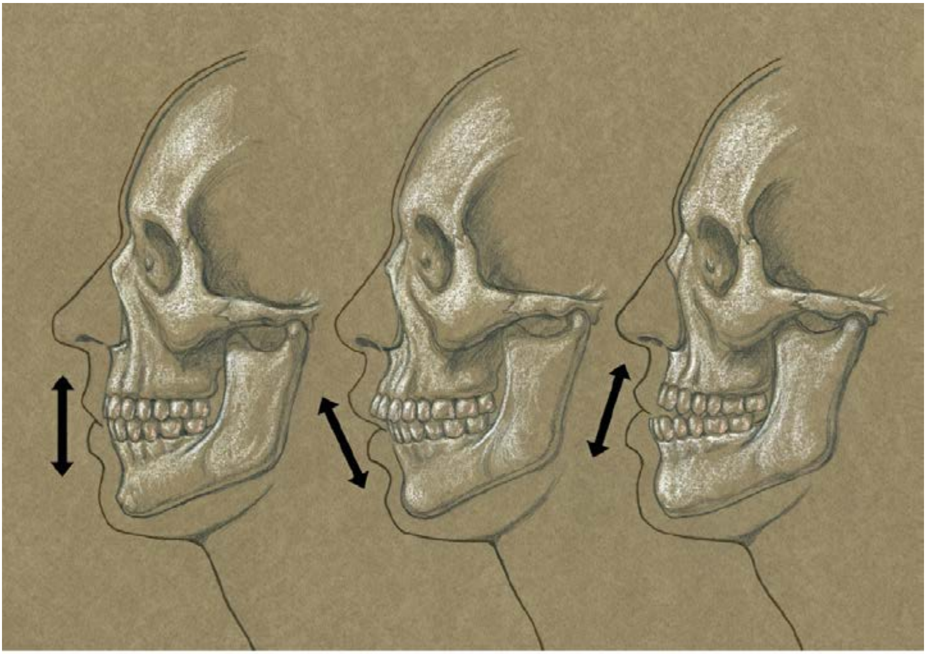
The *teeth* are positioned in the dental arches, which are located in both the maxilla and mandible bones. The basic structure of a tooth consists of a bone-like material called *dentin,* which is covered by *enamel,* an ivory-like material that is the hardest substance in the entire body. Each tooth has three portions: a *crown, neck,* and *root.* Each is individually rooted in a tooth socket, anatomically known as the *alveolus*; the *gingiva* (gum) usually obscures the structure of the neck. The crown—the exposed portion of the tooth—is the structure that interests artists most when they depict the teeth in open-mouthed expressions.

When depicting a person who is smiling with parted lips, it is essential for the artist to understand the shape and placement of the teeth located on the front portion of the dental arches. On smiles with parted lips, you generally see six frontal teeth on the upper arch. Make sure to position the two large front teeth on each side of the midline of the head;

otherwise, the teeth will look out of alignment. When observing faces with widely opened mouths, you will see part of one of the dental arches (sometimes both) curving within the structure of the mouth. The perspective of the curving arch depends on your particular viewpoint of the head. If a head with a wide-open mouth is tilting down, portions of the lower dental arch are usually seen curving upward. When the head is tilting back with a wide open mouth, the upper dental arch is partially seen, curving downward (see this page).

The relationship between the upper dental arch and the lower dental arch when the jaw is closed is called *dental occlusion.* The alignment of the upper and lower teeth can influence the soft-tissue forms of the lower face, especially the lips. Teeth that line up with their front edges nearly touching are in an *edge to edge* occlusion, which tends to produce a more vertical alignment between the upper and lower lips when seen in a profile view. But this alignment shifts if the upper teeth slightly overlap the lower teeth (an *overbite*) or the teeth in the lower dental arch slightly protrude past the upper teeth (an *underbite*). These three basic alignments are shown in the next drawing. *Malocclusion* is the term for a noticeable overlapping or overcrowding of the teeth and possible misalignment in the mandible, producing more extreme versions of the overbite and underbite conditions. Malocclusions greatly affect the softer forms of the lower face.

DENTAL OCCLUSIONS—THREE TYPES

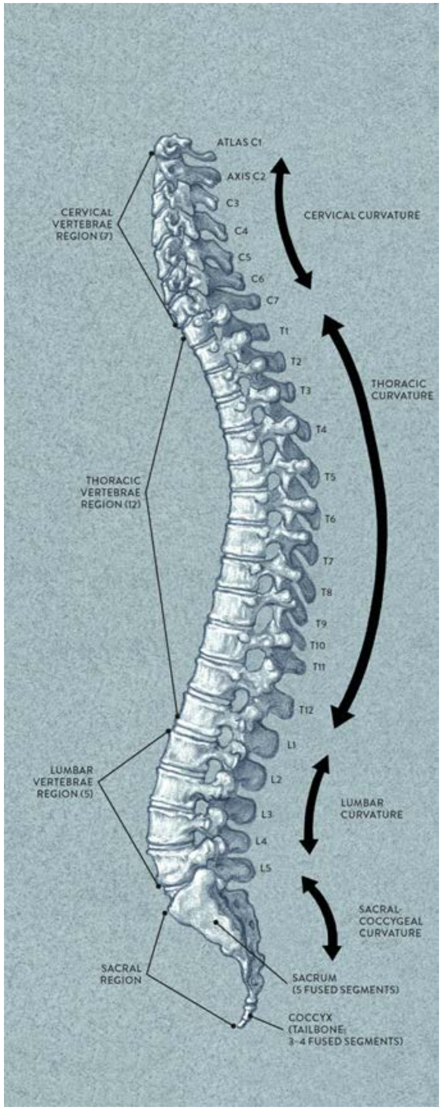


Edge to edge   Overbite   Underbite

The Vertebral Column

The *vertebral column,* also called the spine or backbone, consists of twenty-four individual *vertebrae* (sing., *vertebra*) placed atop each other and (with the exception between the first two neck vertebrae) separated by fibrous pads called *intervertebral discs*. As the name *vertebral column* suggests, it can be thought of as a supporting column for the head. The vertebral column also bears the weight of the upper body, protects the spinal cord, and allows for movement. For artists, the vertebral column is an important structural landmark indicating any rotating, tilting, or twisting action within the rib cage and pelvis regions. The position of the vertebral column is one of the first clues for assessing the line of action (see this page), especially in gesture poses.

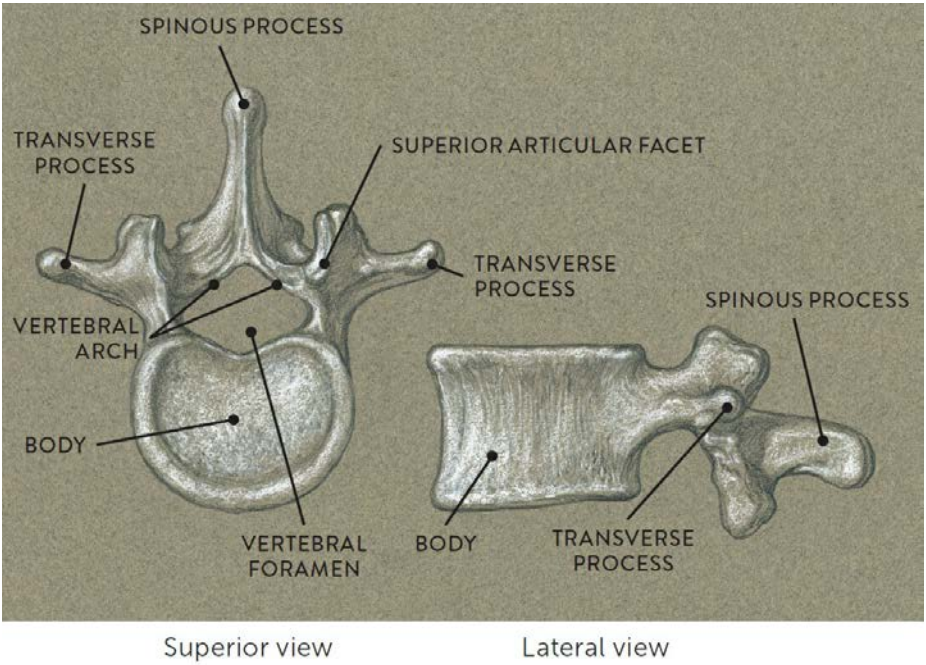
The following-hand drawing depicts the structure of the vertebral column as seen in a lateral (side) view. The vertebral column is divided into four distinct regions: *cervical, thoracic, lumbar,* and *sacral.* The cervical (neck) region contains seven vertebrae, the thoracic (rib cage) region twelve vertebrae, and the lumbar (small of the back) region five vertebrae, totaling twenty-four vertebrae. The sacral region contains the fused vertebrae of the sacrum bone and the coccyx (tailbone). Each individual vertebra on the chart is assigned a letter and number to designate its location and the region it belongs to: For example, C1 means the first vertebra of the cervical region.



From this side view you can see how the vertebrae are not stacked absolutely vertically, as they appear to be from a front or back view, but create a series of subtle curves. The four curves correspond to the four regions of the vertebral column. When you observe a standing figure from the side, you can sense these curves very easily. Many novice artists depict the side of the figure too stiffly, giving the spine a ramrod

appearance. But recognizing these curves helps give the figure's spine a sense of natural, rhythmic flow.

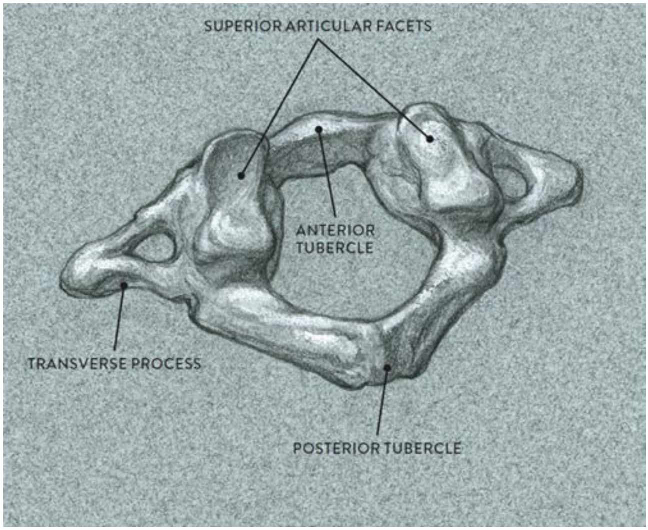
Each vertebra has two basic components, a bony cylindrical drum (called the *body*) and a bony arch (*vertebral arch*). On the arch component there are many projecting bony structures. These include the *spinous process,* which projects in the posterior direction, and the two *transverse processes,* which project on either side of the arch. These projecting shapes serve as attachment sites for ligaments and tendons of the various muscles of the back and usually cannot be seen on the surface, with the exception of a few of the spinous processes, which sometimes appear on the surface as small beads, especially when the figure bends forward at the waist.



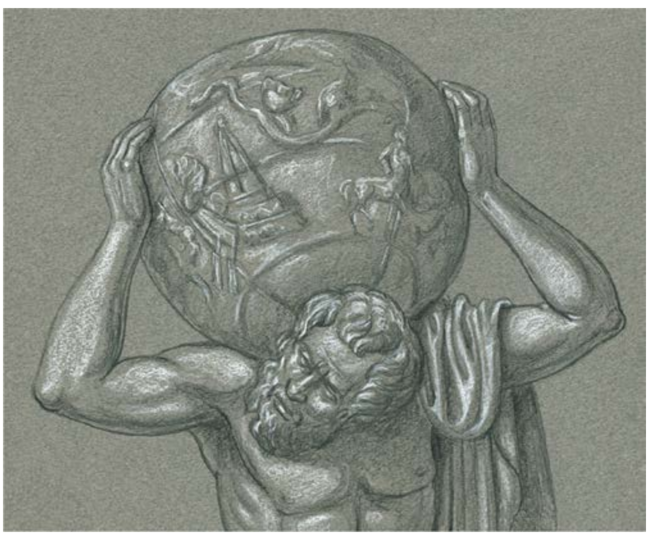
First lumbar vertebra (L1)

The drawing above shows two views of a lumbar vertebra. Although there are some differences in shape between the cervical, thoracic, and lumbar vertebrae, their features are basically similar—except for the first two cervical vertebrae (C1, C2), as we shall see shortly.

Now let's look briefly at the individual regions of the vertebral column to learn something about their distinctive characteristics. The first region, the cervical vertebrae, consists of the seven vertebra of the neck. The upper two cervical vertebrae are called the *atlas* and the *axis*. These two vertebrae, while not noticeable on the surface form, are important in the movement of the head, as we shall see in the next chapter.



Atlas vertebra (C1), three-quarter posterior superior view

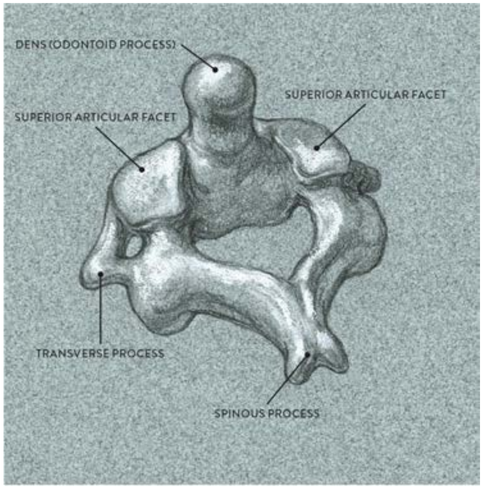


Farnese Atlas

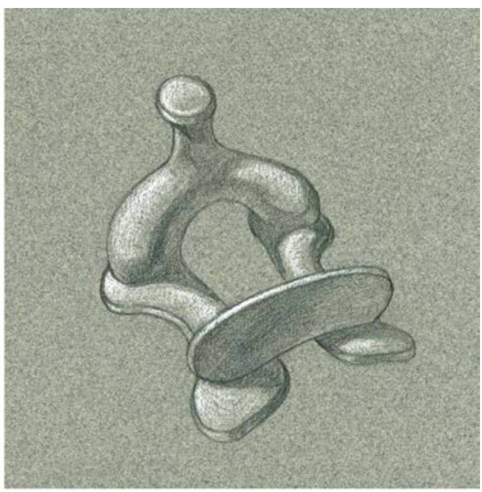
The atlas cervical vertebra (C1) helps support the cranium. Its *transverse processes,* extending horizontally on each side of the vertebra, are attachment sites for various ligaments and tendons. From the first two following drawings, you can see how the atlas

vertebra got its name. It was named for Atlas, the Titan of Greek mythology who supported the world or heavens. The *Farnese Atlas* is a second-century Roman copy of a Hellenistic sculpture depicting Atlas holding a celestial sphere.

THE AXIS VERTEBRA RESEMBLING A SADDLE TREE



Axis cervical vertebra (C2), three-quarter posterior superior view



Saddle tree

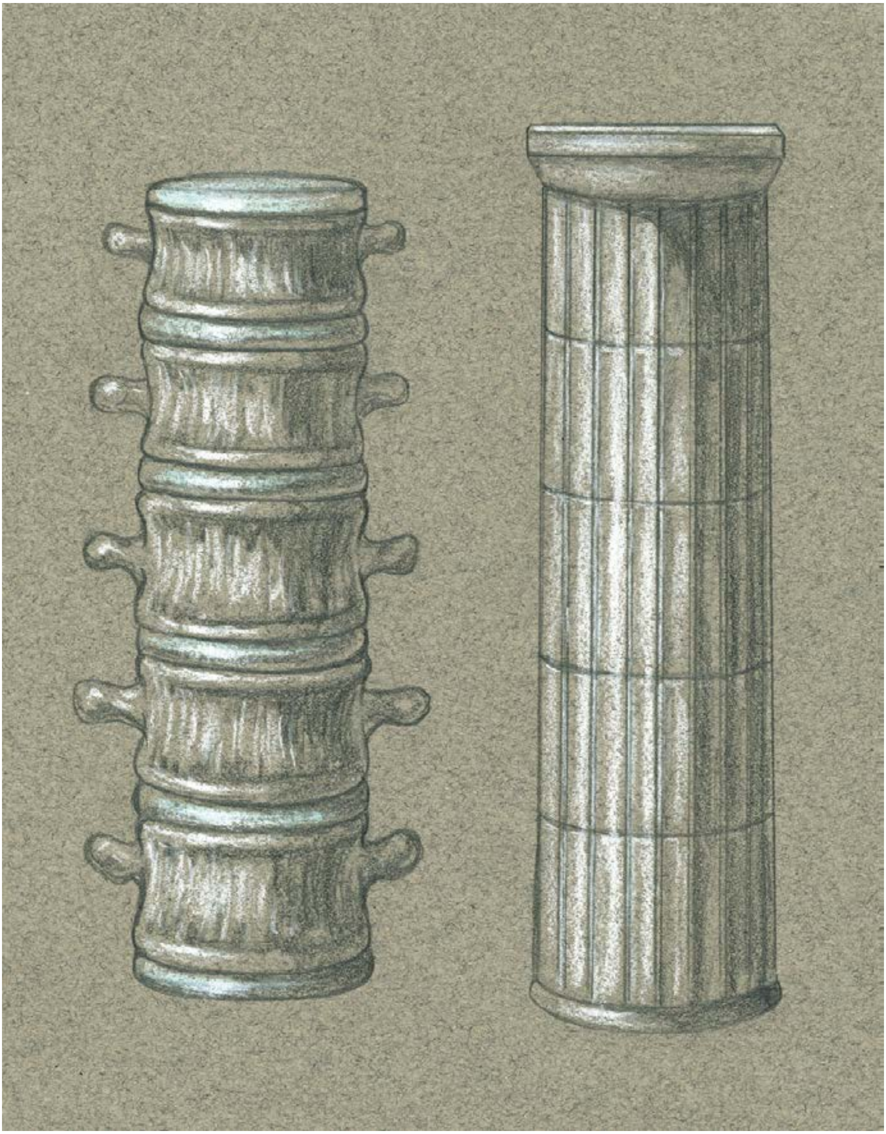
The axis cervical vertebra (C2) is positioned beneath the atlas vertebra (C1). The small, spherelike shape of bone projecting upward like a saddle horn is called the *dens* or *odontoid process* and articulates with the anterior tubercle of the atlas vertebra sitting just above it. Looking at the previous two drawings, you can see how the axis vertebra is shaped somewhat like a saddle tree, a structural device within saddles that keeps the rider from putting too much pressure on the horse's spine.

For artists, the other important cervical vertebra is the *seventh vertebra* (C7), also called the *vertebra prominens*. That's because the spinous process of this vertebra appears as a small bony bump at the back of the neck. This small form might seem insignificant, but it is actually a vital bony landmark. In back and side views of the figure, it tells you where the neck anatomically ends and where the rib cage begins.

The second region of the vertebral column consists of the twelve thoracic vertebrae—the vertebrae of the thorax, or rib cage. These are the vertebrae to which the ribs attach, creating the birdcage shape of the rib cage.

The third region consists of the five lumbar vertebrae. These comparatively massive vertebrae, which define what is commonly called the small of the back, are the bony transitional structure connecting the rib cage and pelvis, and they help bear the weight of the rib cage and cranium and all the various associated soft-tissue structures (muscles and organs). When viewing the lumbar vertebrae from the front of a skeleton, it is possible to see a resemblance to an ancient Greek column, as shown in next the drawing.

LUMBAR VERTEBRAE RESEMBLING A GREEK COLUMN



LEFT: Lumbar vertebrae (L1-L5), anterior view

RIGHT: Greek column (Doric order)

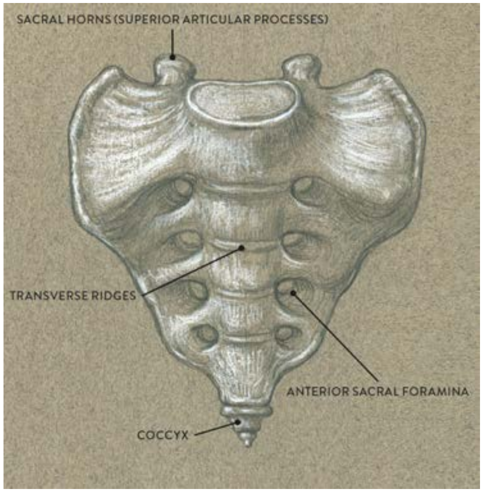
Finally, we reached the last region of the vertebral column, called the sacral region, which consists of the *sacrum* and *coccyx* (tailbone). The sacrum and coccyx serve not

only as the base of the vertebral column but also as the middle portion of the pelvis.

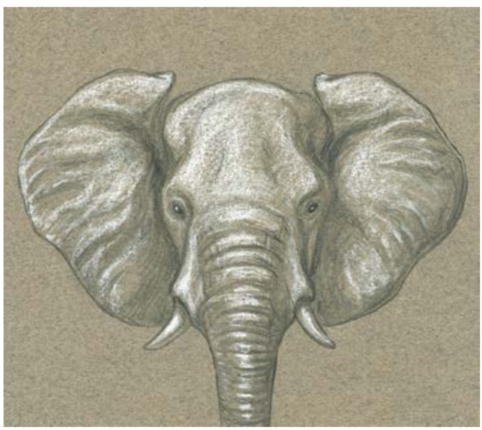
The sacral region is an important bony landmark for locating the general placement of the pelvis. The bone is covered with ligaments and a thin layer of subcutaneous tissue that softens the bony triangular shape when seen on the living model. The sacrum is easily identifiable, with its upper portion flanked by two small depressions in the skin (*sacral dimples*) and its apex pointing downward toward the *gluteal cleft* (the separation of the gluteus maximus muscles). The coccyx curves inward and is usually hidden by the *gluteus maximus* muscles (buttocks); it can be seen only on extremely thin individuals.

The sacrum bone resembles the head of an elephant, as can be seen in the following drawing. In Hindu tradition, the body's energy centers are called *chakras,* and the first, or root, chakra is located at the base of the spine, at the sacrum bone and coccyx. Ganesha, a Hindu god with the head of the elephant, symbolically resides in the root charkra, so it's interesting that the sacrum bone, from the anterior view and even in side views, looks so much like an elephant's head.

THE SACRUM RESEMBLING AN ELEPHANT’S HEAD



Sacrum, anterior view



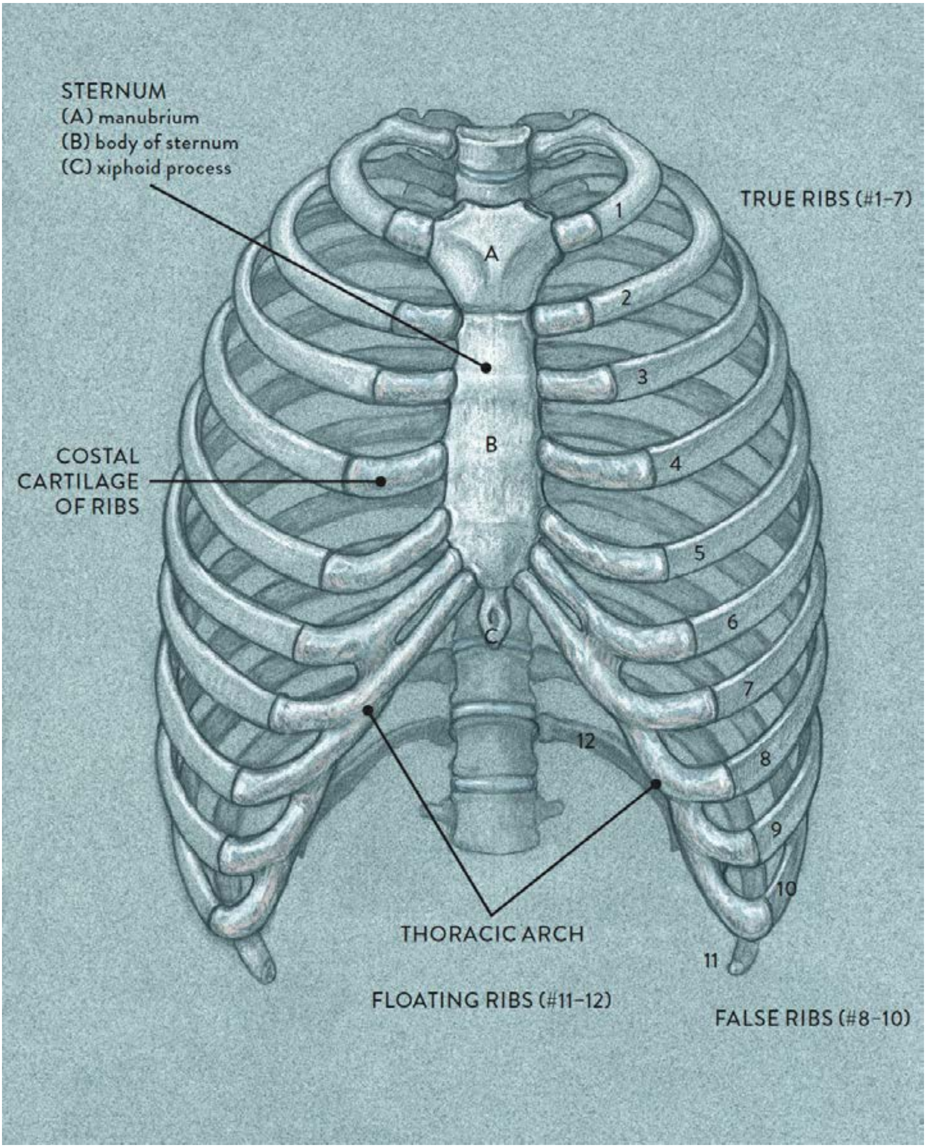
Head of an elephant

The Thorax (Rib Cage)

The *thorax,* or rib cage, consists of twelve pairs of ribs, together creating a cagelike structure. The first seven pairs of ribs (called *true ribs*) connect to the first seven thoracic vertebrae, swinging around to attach, via cartilage, into the sternum (breastbone) in the front. The *costal cartilage* (or *rib cartilage*) is a small, sturdy bar of hyaline cartilage attaching directly into the sternum to allow slight gliding movements during respiration. The next three pairs (called *false ribs*) also attach to the thoracic vertebrae, but as they swing around toward the front they do not attach directly into the sternum. Instead, their cartilage joins together and then joins into the cartilage of the last true rib. This fusion of cartilage is a branchlike structure that creates most of the *thoracic arch* (*rib cage arch*). The rib cage arch, comprised entirely of cartilage, can be seen on the surface in certain poses, such as when the figure is reaching upward or intentionally pulling in the abdominal muscles.

The last two pairs of ribs, called *floating ribs,* begin from the thoracic vertebrae like the others, but they are not long enough to attach into the sternum or even to “share a ride” with the rib cage arch.

THE THORAX (RIB CAGE)—ANTERIOR VIEW

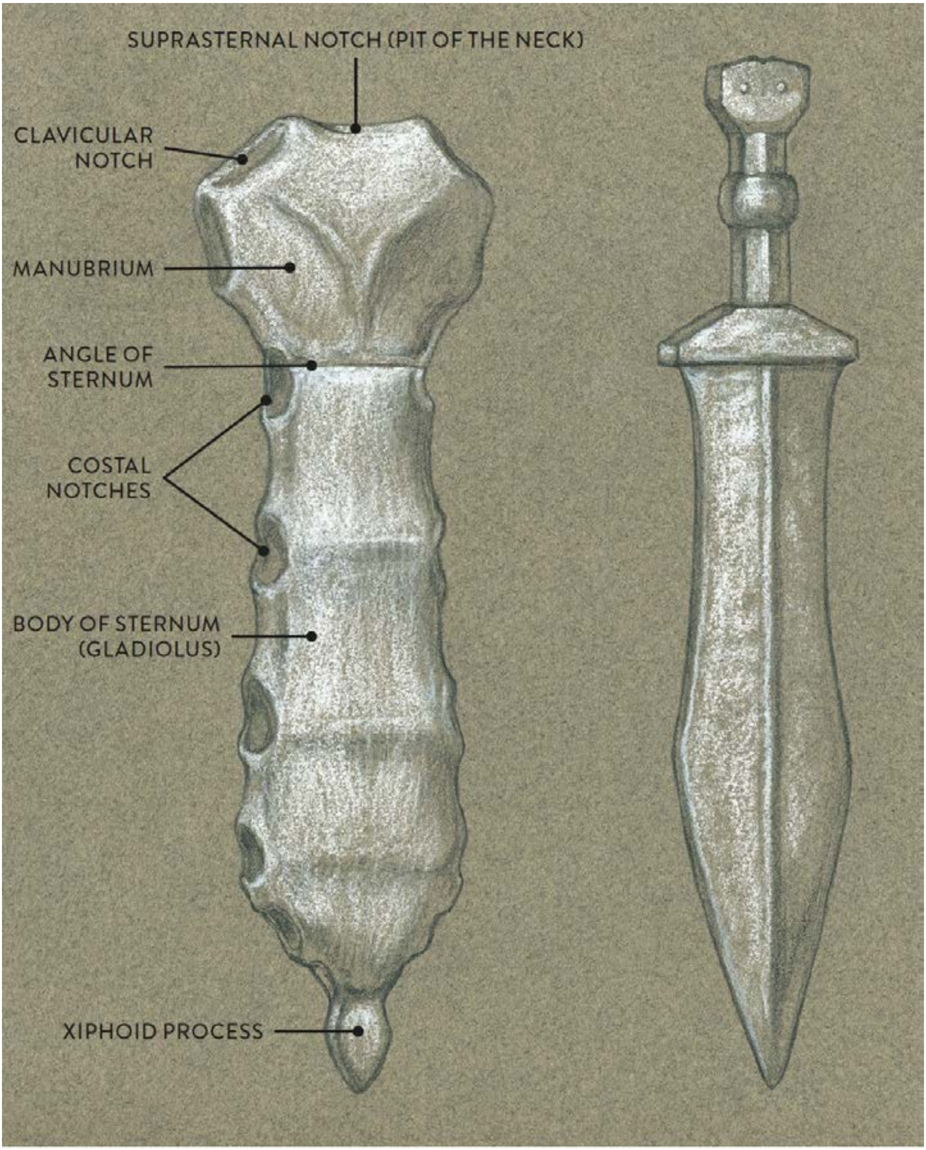


The Sternum

The *sternum,* or breastbone, is a long, thin bone composed of three sections that together resemble a small sword or dagger. In fact, the older term for the *body of the sternum*

was *gladiolus,* which is related to the word *gladiator,* and the sternum actually looks a lot like a dagger used in ancient Roman times, as seen in the following drawing.

THE STERNUM RESEMBLING A DAGGER



LEFT: Sternum, anterior three-quarter view

RIGHT: Roman dagger

The sternum, positioned in the front-central portion of the rib cage, is the bony

structure into which the ribs attach as they swing around from the thoracic vertebrae. The cartilage of the ribs attaches into small depressions called *costal notches* on the outer sides of the sternum. The sternum consists of three components: the *manubrium,* the *body of the sternum,* and the *xiphoid process.* At the top of the manubrium is the *suprasternal notch,* commonly called the *pit of the neck,* which is an essential landmark when depicting the head and neck region, marking the transition between the neck and rib cage in front views. A slight plane change between the manubrium and the body of the sternum, called the *sternal angle,* is an essential for sculptors. The sternum is considered an important bony landmark for all figurative artists because it can indicate exactly what position the rib cage is in in any frontal or three-quarter pose—especially useful for depicting any rotation or tilting action within the torso region.

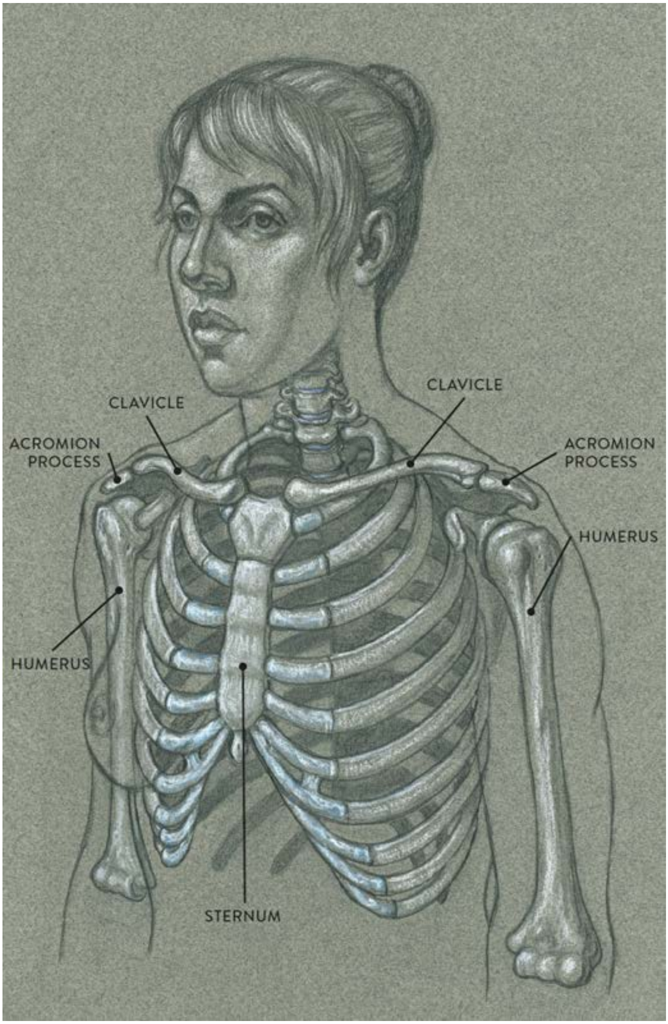
The Shoulder Girdle of the Rib Cage

The *shoulder girdle* consists of two clavicles (collarbones) and scapulae (shoulder blades), which form a somewhat bony ring encompassing the rib cage. The girdle is instrumental in allowing movement of the upper limb. Various muscles from the torso and arm attach into the shoulder girdle to help move the scapula bones, clavicles, and humerus bones to different positions.

The Clavicle

The two *clavicles,* or *collarbones,* are slightly curved bones, somewhat serpentine in shape. Although the bones appear straight in some poses, the serpentine shape is apparent in a three-quarter view or if the model is bending in a forward direction. The clavicles are positioned on either side of the top portion (manubrium) of the sternum with the suprasternal notch (pit of the neck) in between. The inner end (*medial end, sternal end*) of each clavicle appears as a small protrusion on the surface. At the outer end (*lateral end, acromial end*) of the clavicle, the form is flatter yet appears near the skin as a small bump, located slightly above the flat plateau of the acromion process of the scapula. The next drawing shows the clavicles' serpentine appearance, especially in the farther clavicle.

PLACEMENT OF THE CLAVICLES



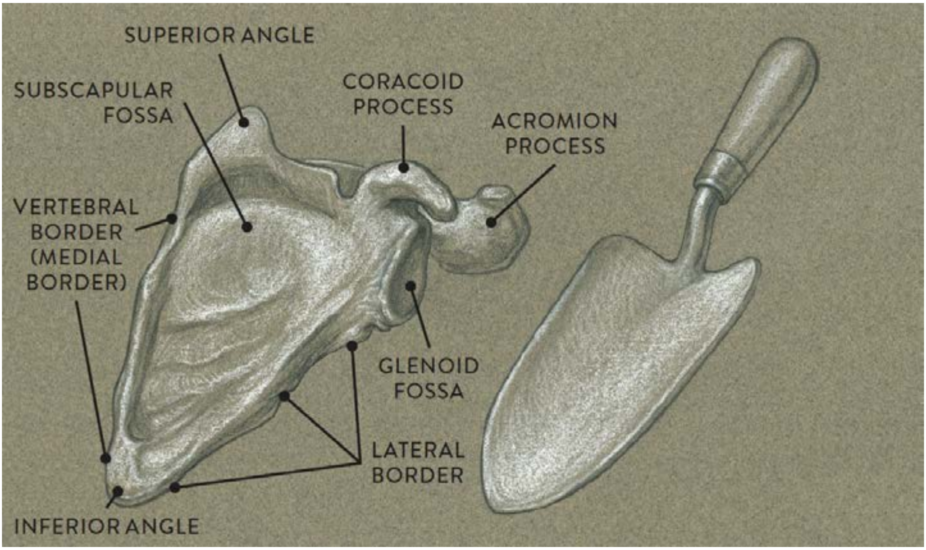
Three-quarter view of torso, with sternum, acromion process of scapula, humerus, and rib cage

The Scapula

The two *scapulae* (sing., *scapula*) are elongated, triangularly shaped bones, slightly curved to glide over the curved rib cage. Although the Latin name *scapula* (pron., SKAP-yoo-lah) means *shoulder blade,* the Greek root *skaptein* means “to dig”—most likely a reference to the scapula’s trowel-like shape, which is especially apparent when

viewed from its anterior surface (*ventral surface, costal surface*), as can be seen in the following drawing. There is archeological evidence that people of Paleolithic times used the scapulae of large animals as digging tools.

THE SCAPULA RESEMBLING A GARDEN TROWEL



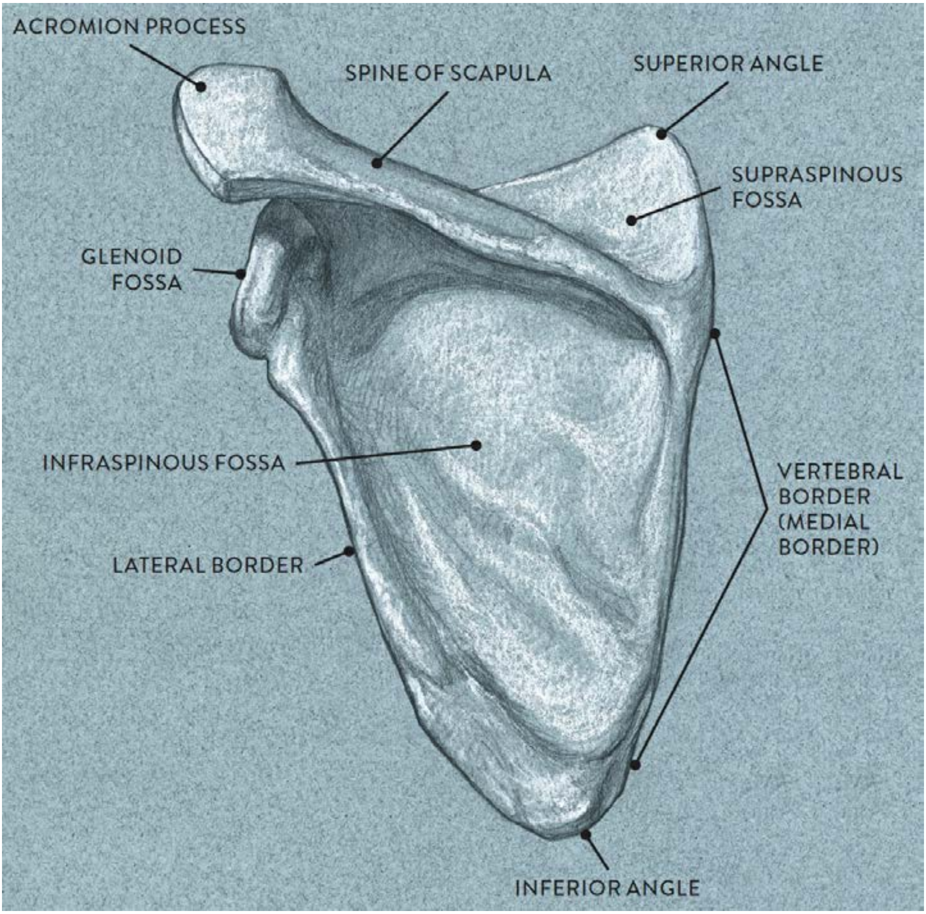
LEFT: Left scapula, anterior view

RIGHT: Garden trowel

Viewed from the back, the scapula has a projection of bone in the upper region that appears as a tilting ledge. This *spine of the scapula* is an attachment site for the deltoid and trapezius muscles. On the body's surface this bony ledge catches light along its length, making it easy to identify its location. The outer end of the spine of the scapula, called the *acromion process,* is a broad, flat surface that attaches to the outer (lateral) end of the clavicle. The acromion process acts as a protective bony canopy over the shoulder joint. The outer ends of the shoulder girdle are similar to the epaulettes of a military uniform, with the top of each acromion appearing as a circular shape with a flat plane. These regions can also appear as round bony masses at the ends of the shoulders, depending on the position of the upper arms (see this page).

A shallow depression called the *glenoid fossa* is located on the outer portion of the scapula, below the acromion process. This is the socket for the head of the humerus bone of the upper arm. A small projecting bony shape near the upper part of the glenoid fossa is called the *coracoid process*; it is shaped like a small, blunt beak. It serves as an attachment site for muscles. The outer edge of the scapula, closest to the vertebral column, is called the *medial border* or *vertebral border.* Look for this border when trying to locate the position of the scapula on a living model. At times you will also see the bottom corner, called the *inferior angle.* The other elongated border of the scapula is

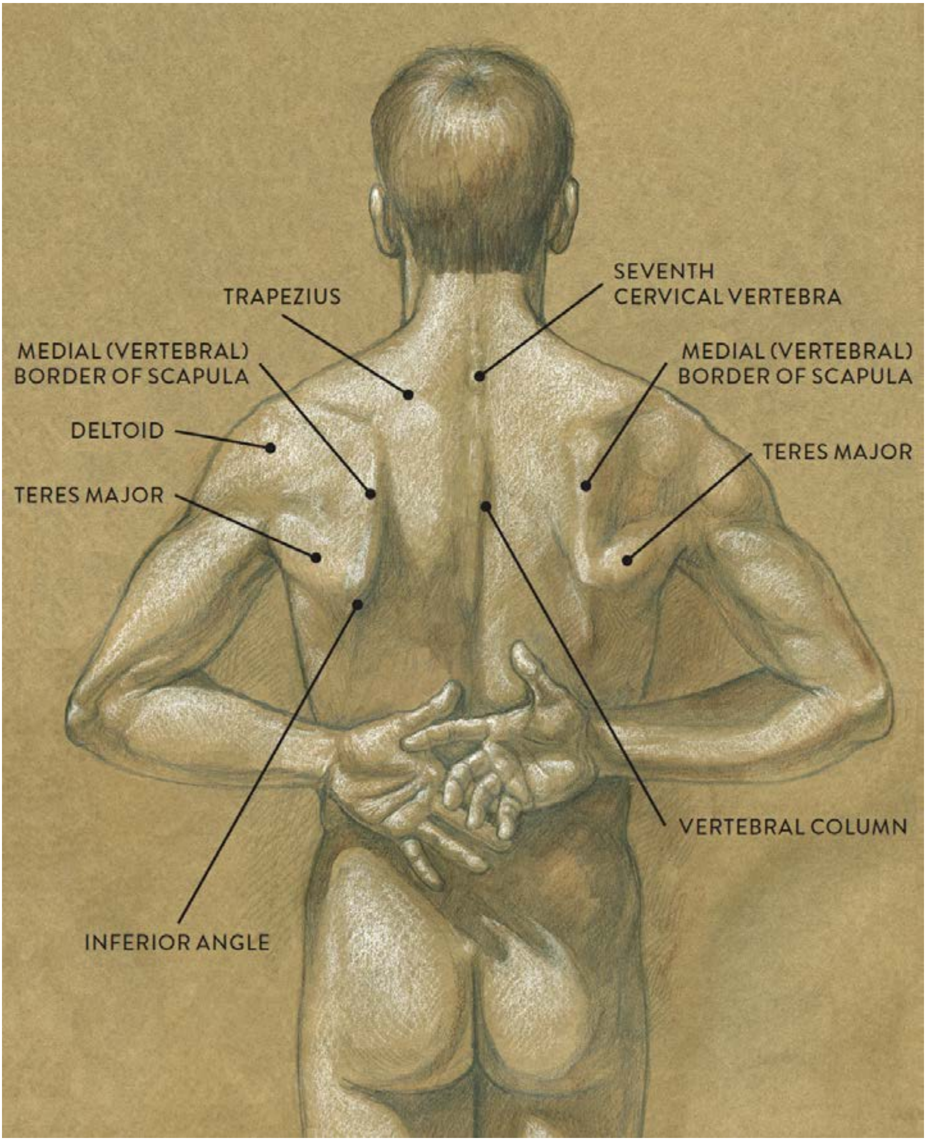
called *lateral border*. This border is hard to detect on the surface because it is covered over by muscles. The *supraspinous fossa* is positioned above the spine of the scapula and appears as a cradle-like bony structure. The *infraspinous fossa* is a large depression below the spine of the scapula.



Left scapula, posterior view

In the life study on the following page, you can see the general shape and position of the scapula bones with the surrounding muscular forms and bony landmarks. Because of the position of the arms in this pose, the vertebral (outer) borders and inferior angles (lower tips) of the scapulae are projecting close on the surface, making it easy to see the shoulder blades' location.

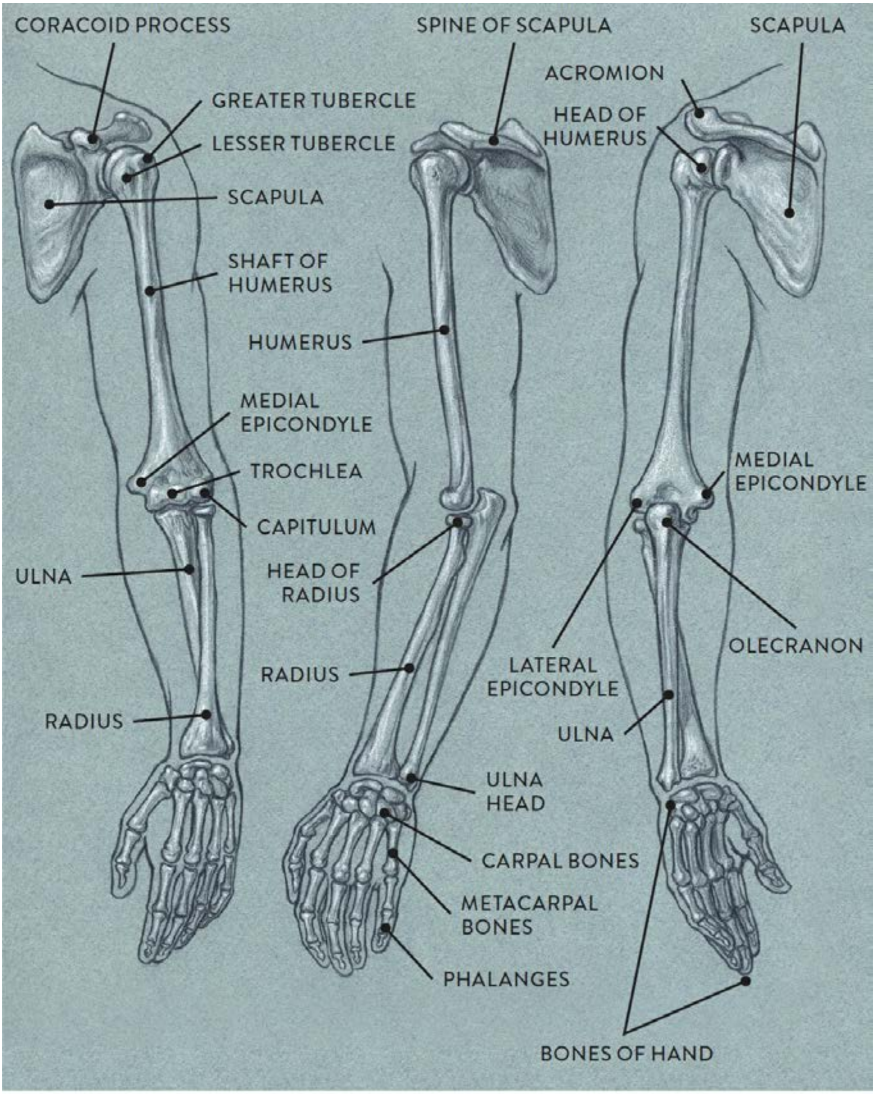
MALE FIGURE HOLDING HIS HANDS BEHIND HIS BACK



Graphite pencil, ballpoint pen, watercolor wash, and white chalk on toned paper.

Bones of the Upper Limb

The bones of the upper limb consist of the humerus of the upper arm and the ulna and radius of the lower arm. The next drawing shows the features and bony landmarks of these bones.



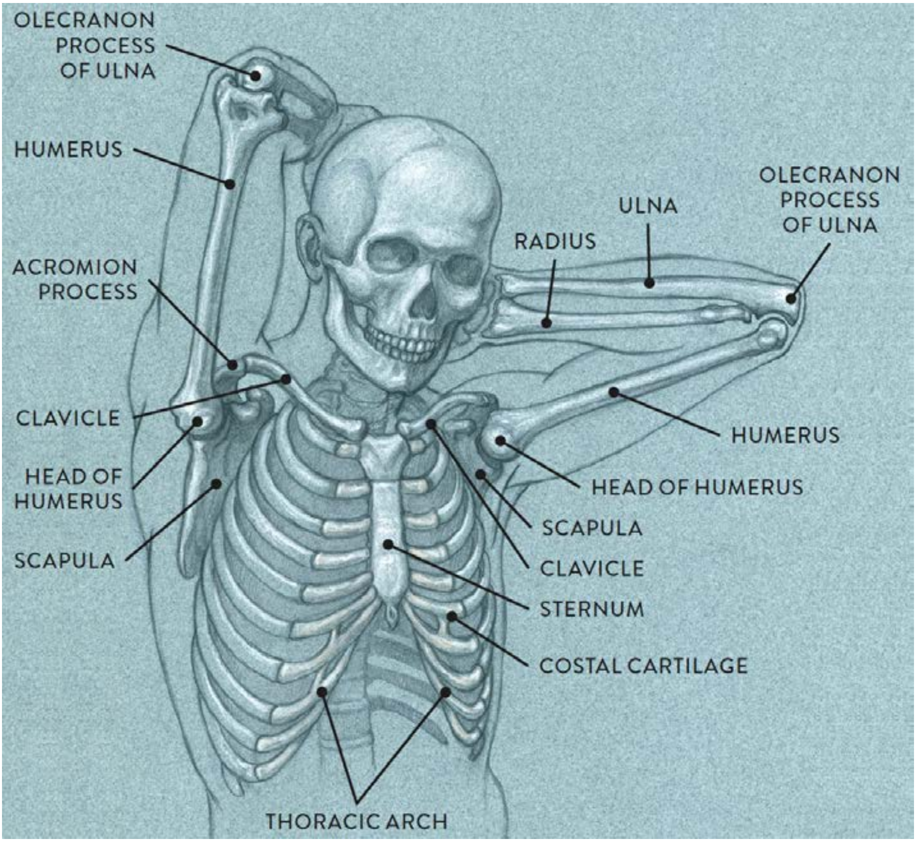
Left upper limb, anterior view

Left upper limb, lateral view

Left upper limb, posterior view

The following drawing, an anterior three-quarter view of a skeleton torso with arms overhead, shows how the shoulder girdle encircles the rib cage and how the upper arms (humerus bones) move in relation to the bones of the scapula, as well as the placement of

the lower arms (radius and ulna bones).

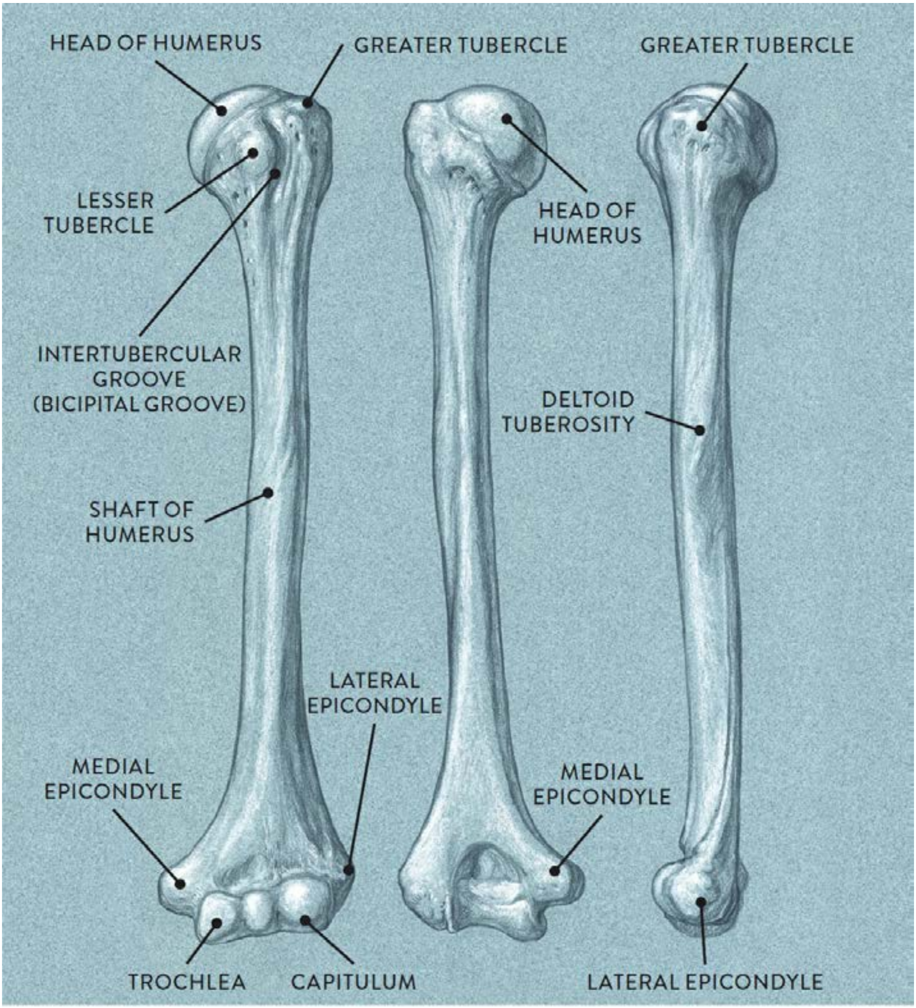


Anterior three-quarter view with arms overhead

The Humerus

The single bone of the upper arm, the *humerus* (pron., HYOO-murr-us) is a typical long bone, with a long shaft that expands at each end into a broader mass. The upper portion, called the *head of the humerus,* has a spherelike shape that fits into the shallow depression (*glenoid fossa*) of the scapula, creating the ball-and-socket joint of the shoulder. The shaft of the humerus is completely covered by muscles and soft tissue. Located midway along the bone is a small textured area called the *deltoid tuberosity.* This is the attachment site for the deltoid muscle. At the lower end of the humerus, the bone flares outward into a wide base. Two bony expansions, called the *medial epicondyle* and *lateral epicondyle,* are the prominent projections. The medial (inner)

epicondyle is usually noticeable on the surface form as a small bump located near the inner side of the elbow (*olecranon*). When the lower arm is bent, the lateral (outer) epicondyle is also seen on the surface as a small bony protrusion, but when the arm is straightened it usually becomes concealed by muscles of the radial group—the large mass of muscle that crosses the elbow joint region. A noticeable indentation, or dimple, in the skin is seen where the lateral epicondyle is located.



Left upper arm, anterior view

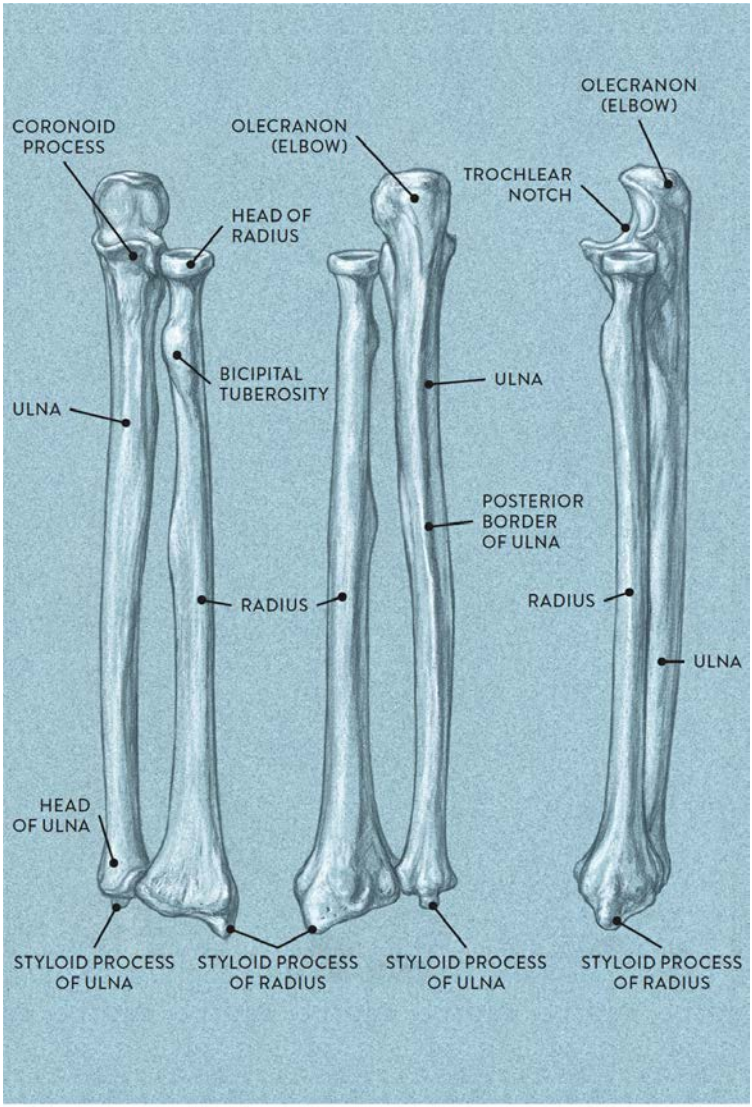
Left upper arm, posterior view

Left upper arm, lateral view

At the lower end of the humerus and between the epicondyles are two additional bony structures. One is the *trochlea,* a spool-like structure, and next to it a spherelike shape called the *capitulum.* Although hidden from our view on the living model they are important for understanding joint movement, as we will see in the next chapter.

The Ulna and Radius

The lower arm contains two bones: the slightly larger one is called the ulna, and the other is the radius. These two bones are positioned parallel to each other when the arm is in the anatomical position or when the hand is supinated, meaning that the palm is facing forward or upward. When trying to locate the position of these two bones in the living model, it is helpful to remember that the radius is always on the thumb side of the wrist and the ulna bone always on the little finger side of the wrist, no matter what the hand or lower arm is doing.

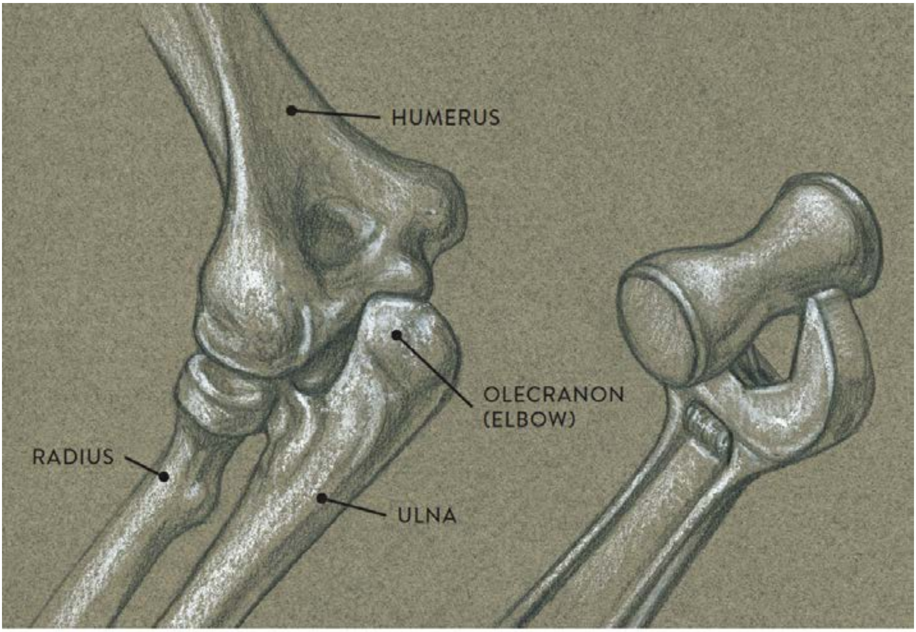


Left lower arm, anterior view | Left lower arm, posterior view | Left lower arm, lateral view

The *ulna* (pron., ULL-nah) has a noticeable landmark, commonly called the *elbow* but known in anatomical terminology as the *olecranon.* It appears as a bony protrusion at the elbow joint. Also located at the upper portion of the ulna is the *trochlear notch* (not seen

on the surface). Shaped much like a crescent wrench (see the following drawing), it hooks around the bottom portion of the trochlea of the humerus bone, creating the hinge joint of the elbow region.

THE ULNA RESEMBLING A CRESCENT WRENCH

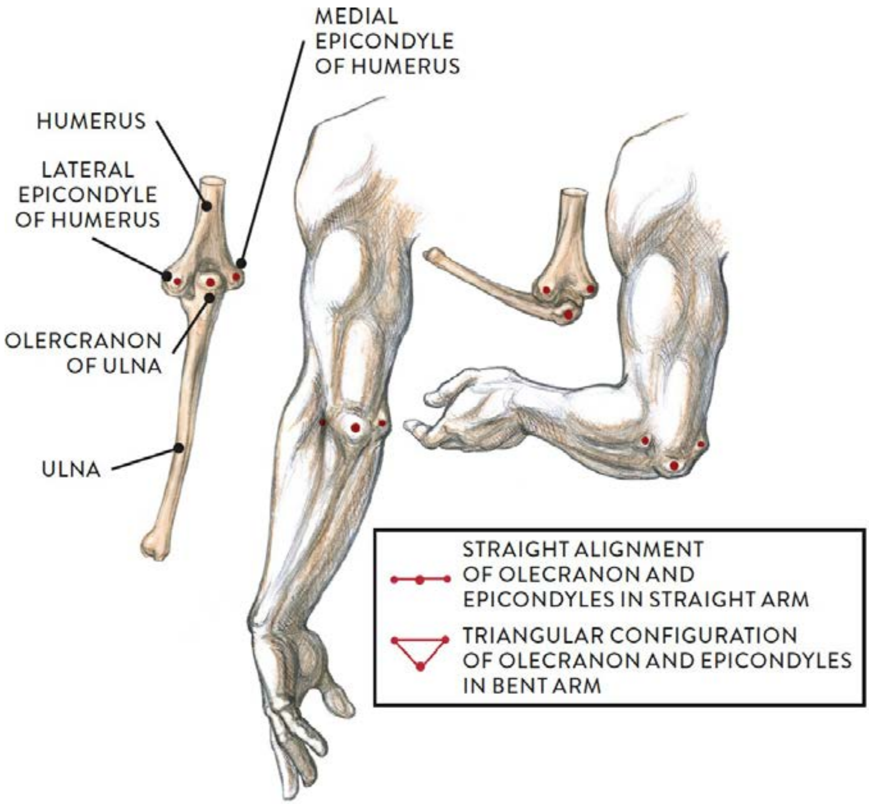


Ulna at elbow region, left arm

Crescent wrench with spool-like form

When the whole arm is straight, the olecranon is level with the medial and lateral epicondyles of the humerus. When the lower arm bends or flexes, the olecranon swings slightly downward and becomes more noticeable on the surface. In the bent-arm position, the elbow bump of the olecranon is lower than the epicondyles, and the three forms have a triangular configuration. The following drawing shows how the elbow's appearance changes as the arm moves.

ELBOW (OLECRANON OF ULNA)



Straight left arm, three-quarter posterior view

Bent left arm, three-quarter posterior view

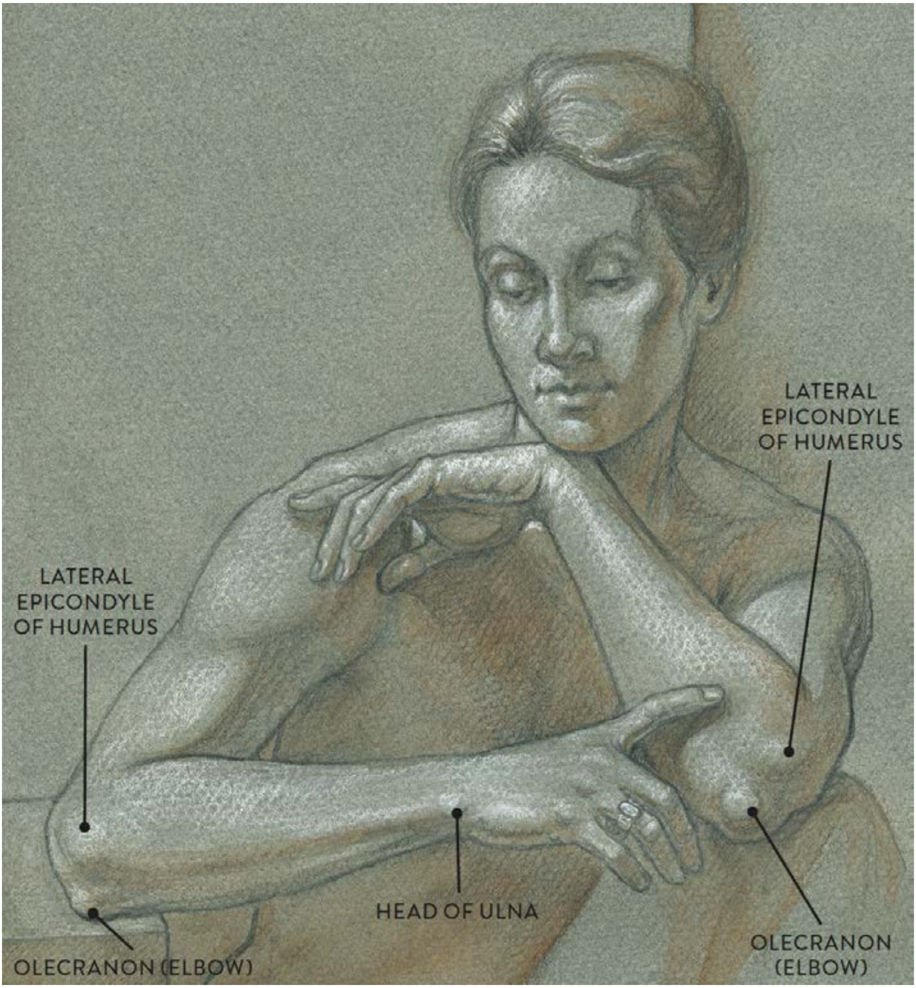
Along most of the length of the ulna is a sharp edge called the *posterior border of the ulna*. This tends to create a skin furrow from the elbow to the wrist. At the base of the ulna is the *head of the ulna,* which appears as a small bony bump on the little-finger side of the wrist. A small extension of bone from the head of the ulna is called the *styloid process of the ulna.*

The *radius* is a slender bone positioned next to the ulna. At the upper portion is the *head of the radius,* shaped like a small wheel. It is held close to the capitulum of the

humerus by a ligament that acts like a supporting strap, letting the head of the radius rotate or spin under the ball-like shape of the capitulum. Slightly farther down from the head of the radius is a small protrusion of bone called the *bicipital tuberosity* (*radial tuberosity*), which is an attachment site for the tendon of the biceps brachii muscle. At the lower end of the radius the bone expands slightly and has a pointy projection called the *styloid process of the radius*.

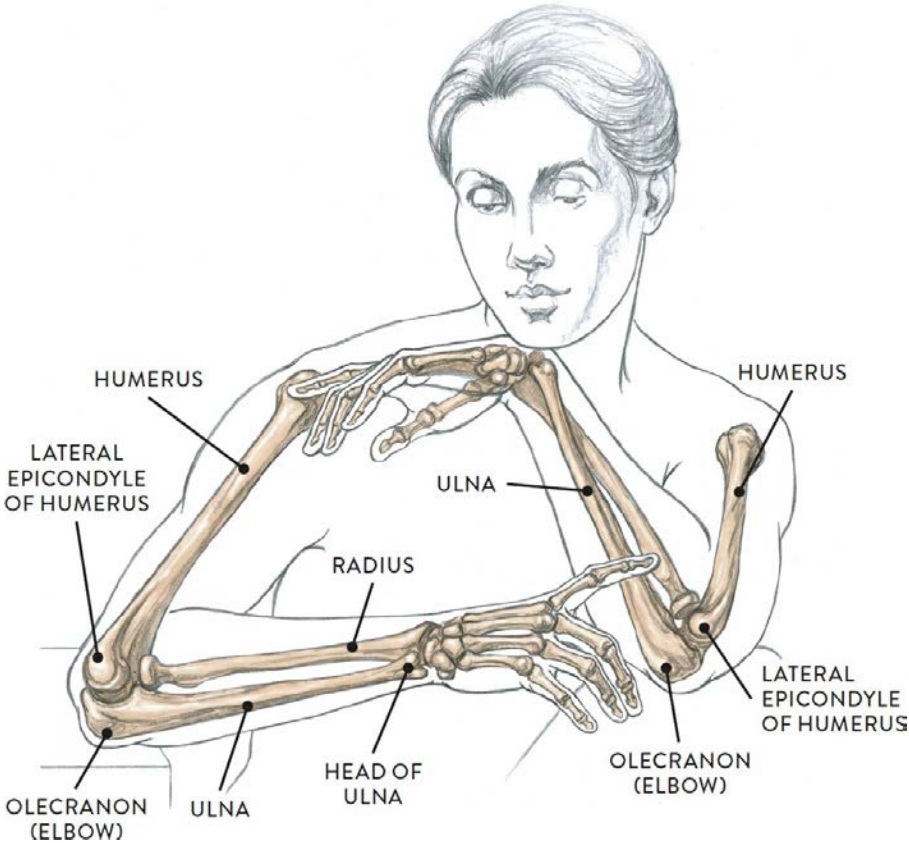
In the life study shown next, we see the arms in a relaxed position with the model's chin gently resting against one hand. The accompanying skeletal diagram shows the slight rotation of the radius rolling over the ulna in the model's left arm.

WOMAN WITH RELAXED ARMS



Graphite pencil, watercolor wash, and white chalk on toned paper.

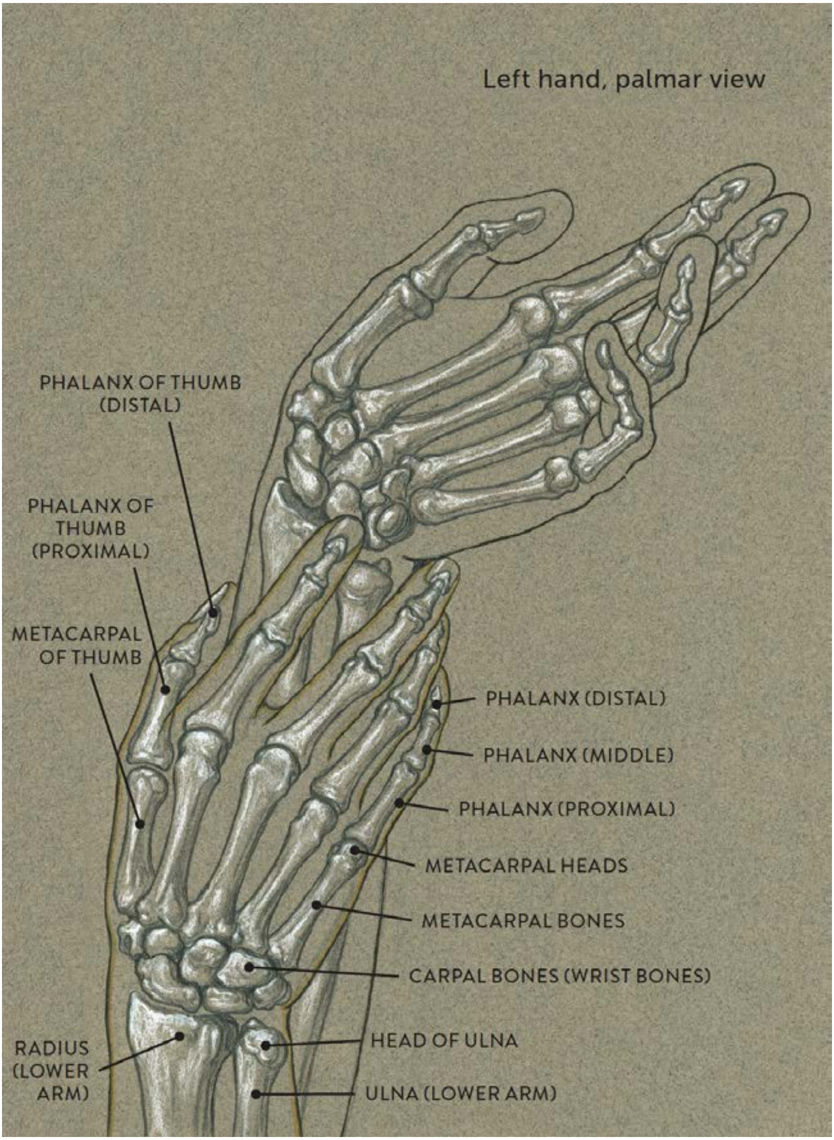
SKELETAL DIAGRAM



Bones of the Hand

The hand consists of several bones, which are conveniently grouped in three sections: the carpal bones (wrist region), the metacarpals (main structure of the hand block), and the phalanges (finger and thumb bones).

The *carpal bones,* commonly called the wrist bones, comprise eight individual bones, divided into two rows. The first row (*proximal row*) contains the *scaphoid, lunate, triquetral,* and *pisaform* carpal bones. The second row (*distal row*) contains the *trapezium, trapezoid, capitate,* and *hamate* carpal bones. Because numerous ligaments attach to and between the carpal bones, and layers of muscles and tendons overlay them, it is hard to detect the carpal bones individually on the surface. However, the pisaform carpal bone marks where the heel of the hand terminates, and at the wrist below the thumb eminence is a subtle bony bump formed by the scaphoid carpal bone.

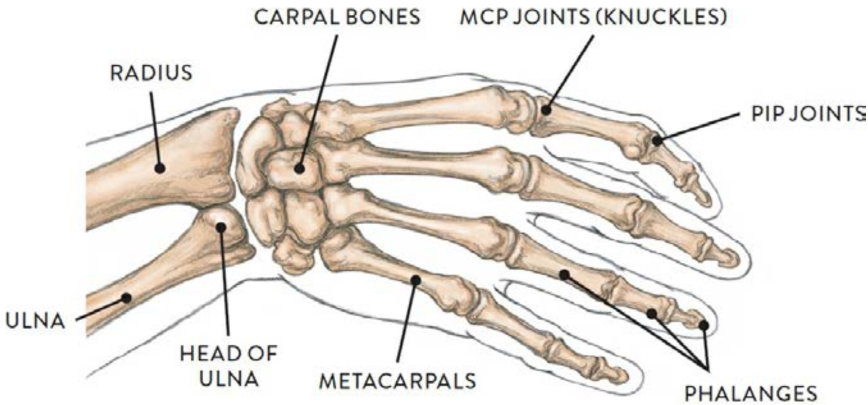


Right hand, dorsal view

Located beyond the group of the carpal bones are the *metacarpals,* five elongated bones making up the general block-shaped structure of the hand. The bony landmarks of the metacarpals that are most clearly seen are the knuckles, which are the *heads of the*

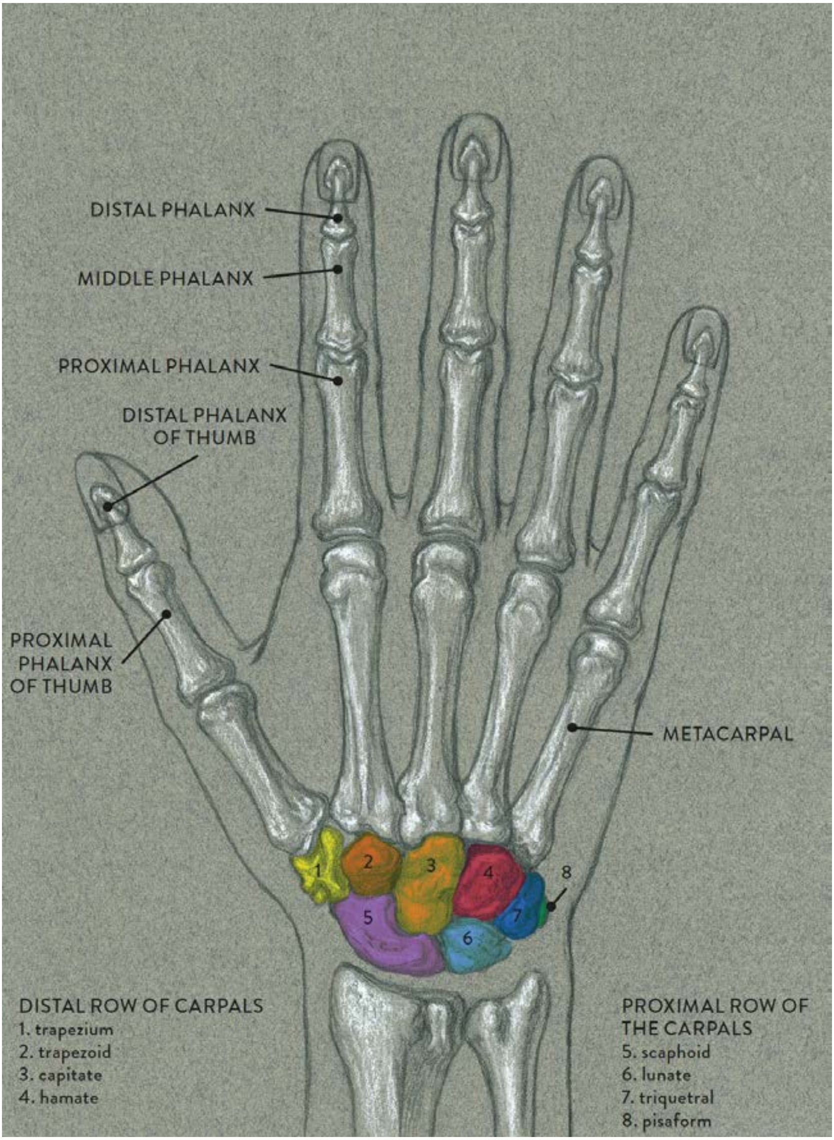
metacarpal bones. These are also known as the *metacarpo-phalangeal joints,* or MCP joints. The knuckles appear as small bony shapes when the fingers bend or the hand clenches into a fist.

SKELETAL DIAGRAM



Right hand, dorsal view

The finger and thumb bones are called the *phalanges* (pl., pron. fah-LAN-jeez; sing., *phalanx,* pron. FAY-links or FAY-lanks). With the exception of the thumb, each finger has three phalanges. The phalanx closest to the finger's attachment on the hand is known as the *proximal phalanx,* and the phalanx farthest away is called the *distal phalanx.* The phalanx between these two bones is called the *middle phalanx.*

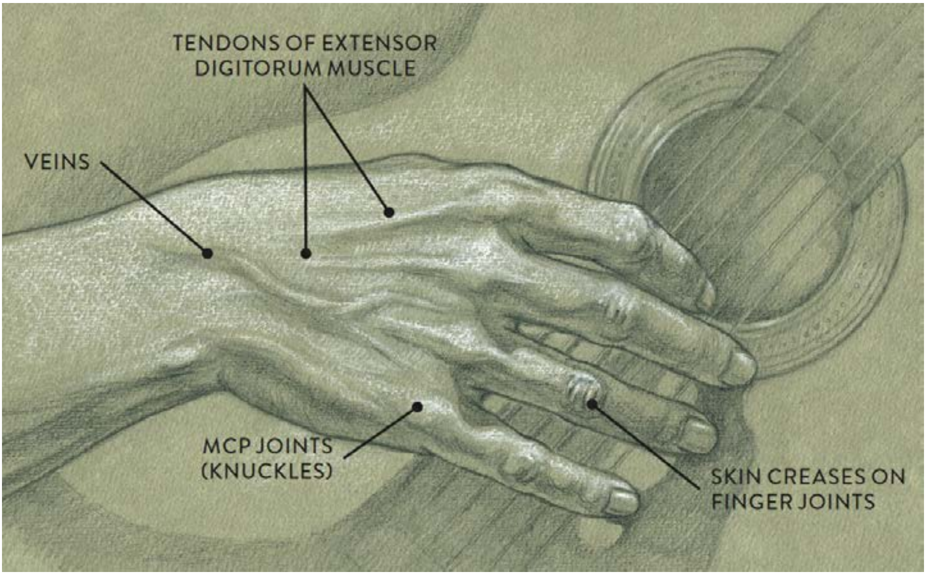


Right hand, dorsal surface

Study of Hand with Guitar, shows various surface forms of the hand, including the metacarpal heads (knuckles), as well as a few tendons. Some veins can also be seen. The accompanying skeletal diagram shows the location of the bones of the hand in this

particular pose.

STUDY OF HAND WITH GUITAR

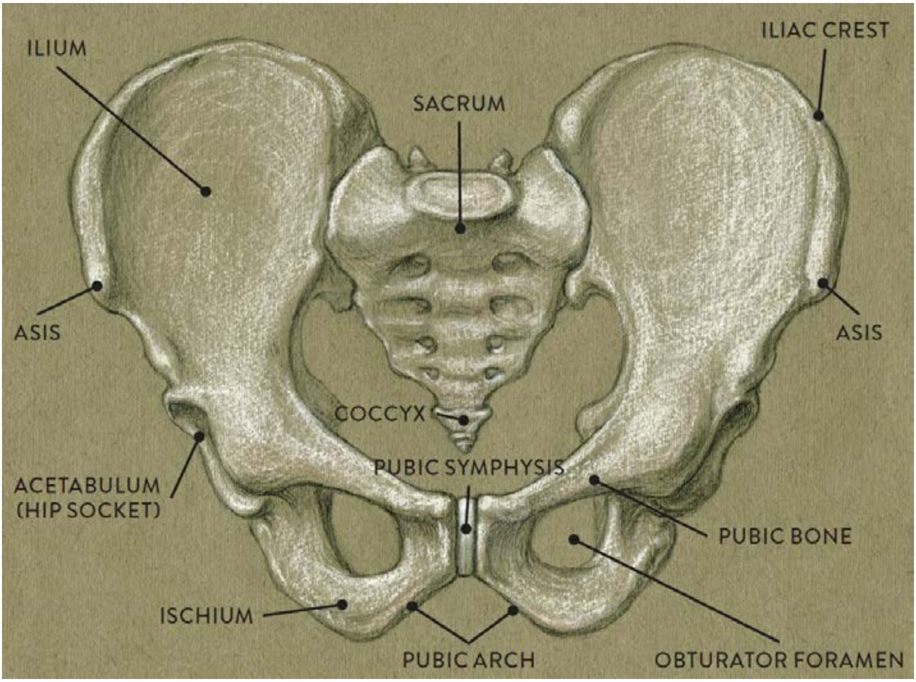


Graphite pencil and white chalk on toned paper.

The Pelvis

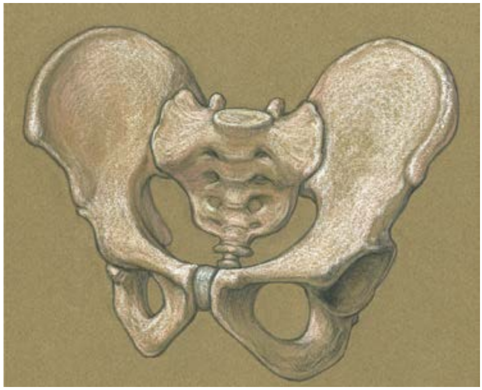
The *pelvis* consists of three main bones: the triangularly shaped bone called the *sacrum* and two large wing-shaped bones, commonly called the *hip bones* (anatomical name, *os coxae*). These three pelvic bones are held together at their joints with layers of ligaments; however, the entire pelvis should be considered as a unit, not as individually movable bones. When the pelvis is tilting, the *whole* pelvis tilts.

THE PELVIS—ANTERIOR VIEW

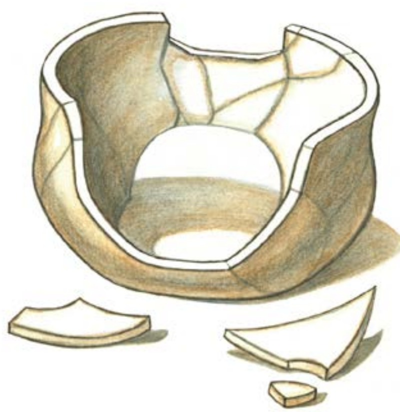


The term *pelvis* comes from a Latin word meaning "basin," and the pelvis resembles a shattered ancient bowl, reassembled but with pieces still missing, as shown in the drawing at bottom right. In fact, the pelvis does function as a vessel for various soft-tissue structures, such as the intestinal tract, as well as serving as a protective bony chamber for a developing fetus.

THE PELVIS RESEMBLING A FRAGMENTED BOWL



Pelvis, three-quarter anterior view



Ancient bowl, partly reassembled

A few bony landmarks on the pelvis are worth noting because they are either seen on the surface or, if hidden, serve as important attachment sites for muscles. Most of these landmarks comes in pairs. The *ilium* is the large, fan-shaped structure in the upper part of each hip bone. Along the top of the entire length of the ilium is a narrow rim called the *iliac crest*. In the anterior view of the pelvis, the iliac crest abruptly ends, and this segment is called the *anterior superior iliac spine,* or *ASIS*. There are two of these structures—one on each ilium bone—and they occasionally appear on the surface as two small bony protrusions on the front of the hips. The two ASIS structures, along with the sacrum and iliac crest, are the only bony evidence of the pelvis seen on the living model,

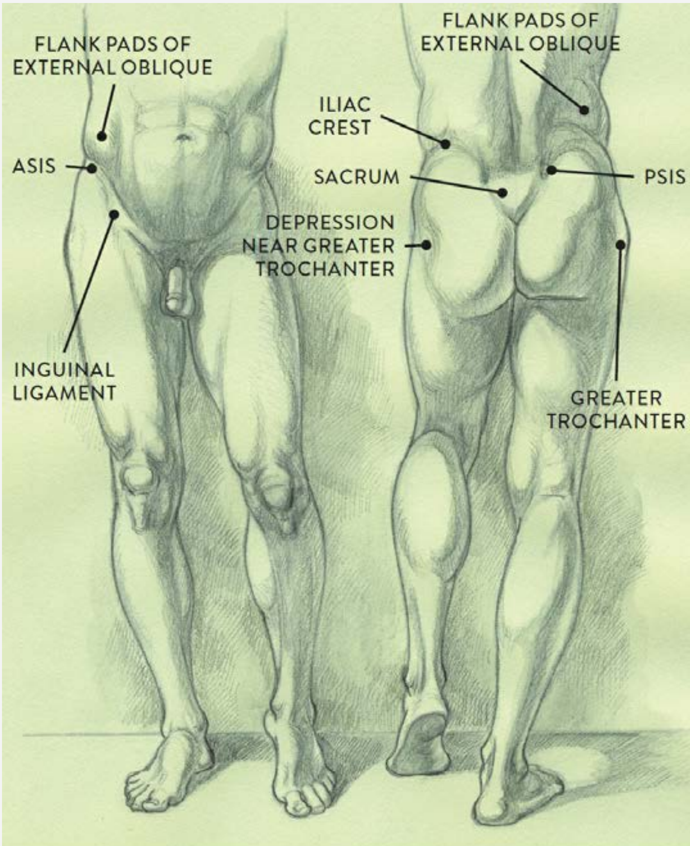
but these landmarks are harder to detect in people who have substantial fatty tissue.

At the other end of the iliac crest is the *posterior superior iliac spine,* or *PSIS*. Each PSIS lies near a noticeable depression or dimple in the skin. These two dimples correspond to the top border of the sacrum of the pelvis.

Differences between the Male and Female Pelvis

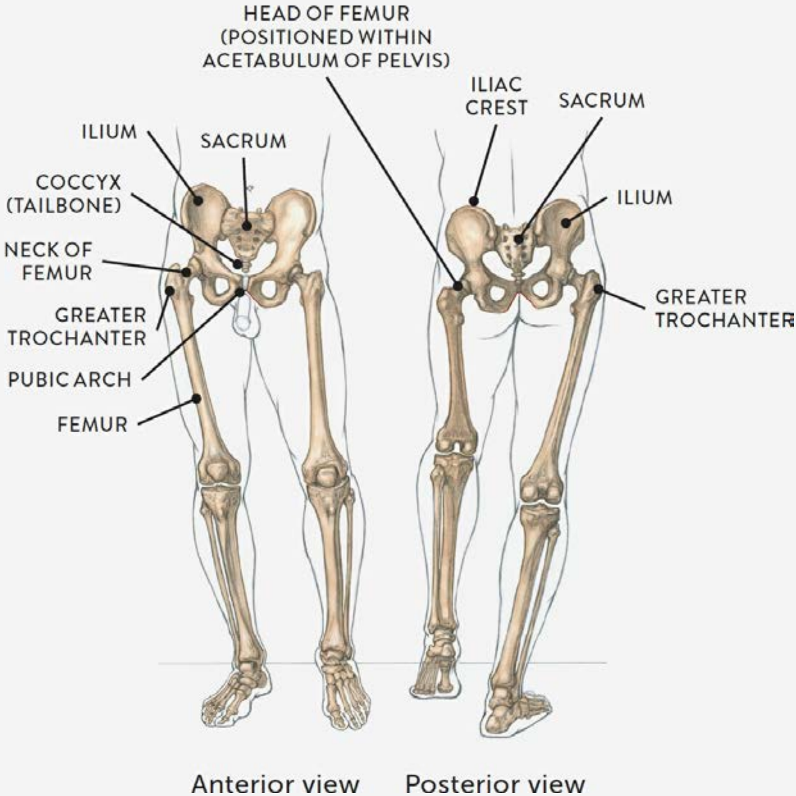
The female pelvis is wider, with a slightly lower ilium, than the male pelvis. Because the female pelvis is wider, the hip sockets (acetabula) are placed farther apart. The neck of the femur is at a more pronounced angle, making the shaft of the femur descend more obliquely in the female than in the male. The protrusion of the greater trochanter will be more evident on the male; on the female it is slightly overlapped with subcutaneous fatty tissue, making it harder to detect on the surface. However, the greater trochanter can be seen in a lean female with minimal fatty tissue. The sacrum is wider in the female, while in the male it is not just narrower, but the coccyx projects inward at a sharper angle. The pubic arch—the inverted V-shaped structure on the lower portions of the ischium bones—is wider in the female, narrower in the male. These differences provide only a general guide, however, because some characteristics can be seen in either sex, depending on the individual. Some women have narrow hips, and some men wider hips.

STUDY OF MALE PELVIS AND LEGS, ANTERIOR AND POSTERIOR VIEWS

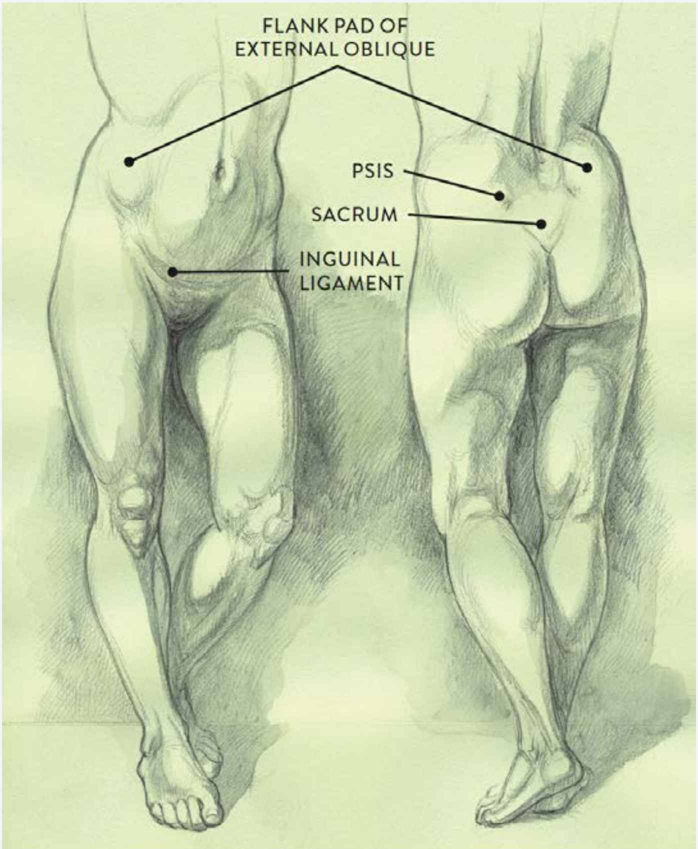


Graphite pencil, ballpoint pen, and watercolor wash on toned paper.

SKELETAL DIAGRAM

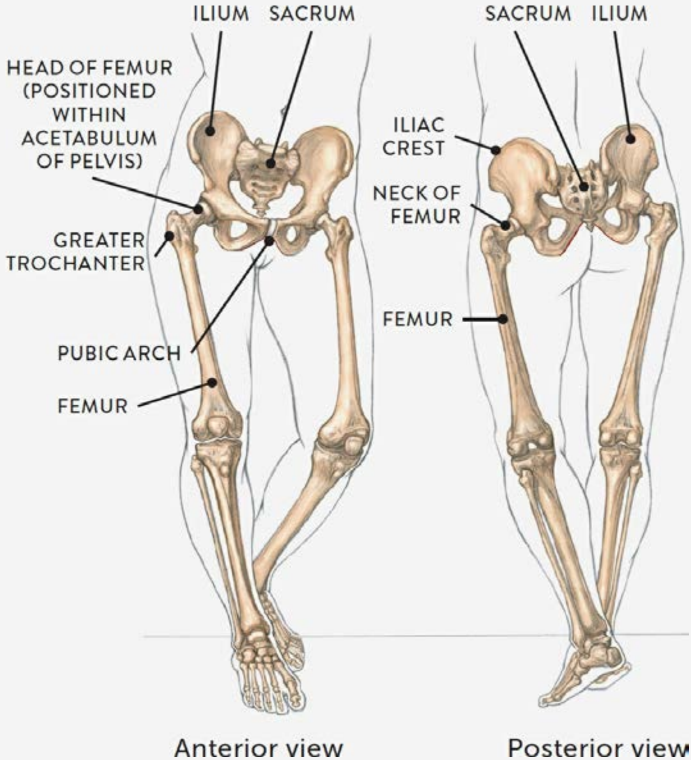


STUDY OF FEMALE PELVIS AND LEGS, ANTERIOR AND POSTERIOR VIEWS



Graphite pencil, ballpoint pen, and watercolor wash on toned paper.

SKELETAL DIAGRAM

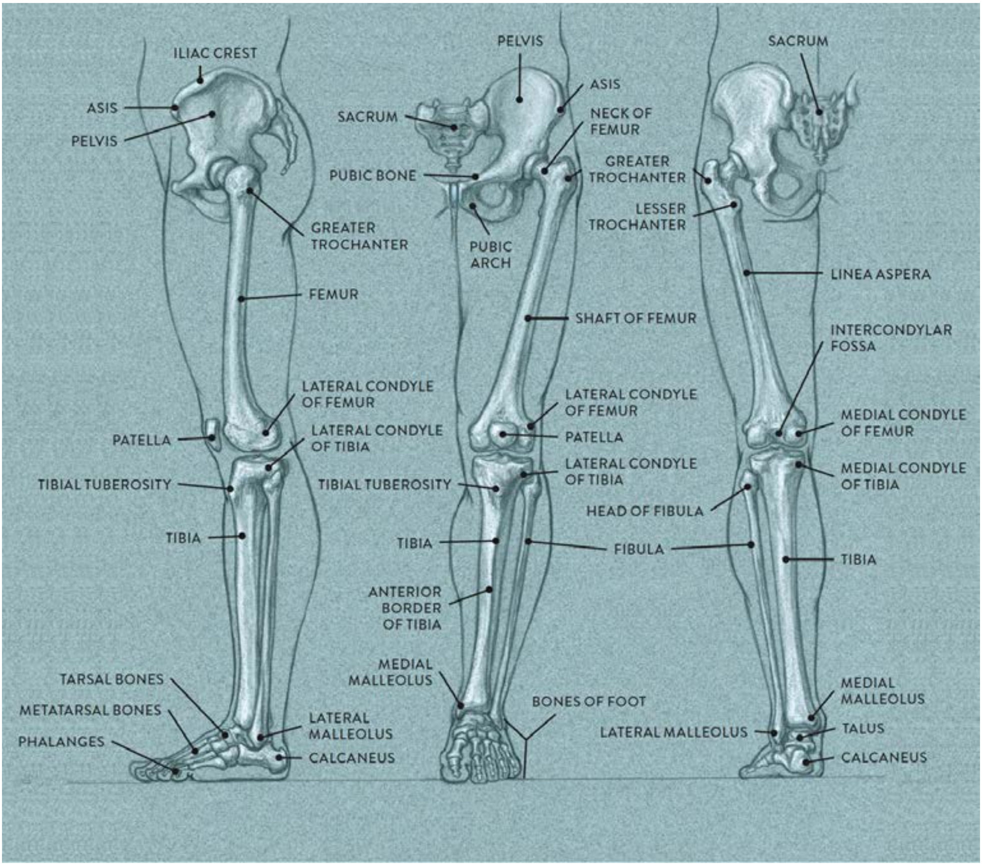


The *ischium* bones, at the bottom portion of the pelvis, look like bagels or doughnuts because of the large opening (called the *obturator foramen*) in the center of each. These bones are not seen on the surface but are essential attachment sites for several upper leg muscles. These are the bones we sit on, and they have a smooth rocking-chair surface along their bottom edge. The *pubic bones* are a pair of bones that make up the bony bridge in the front lower portion of the pelvis and are separated by a fibrous pad called the *pubic symphysis*. An inverted V-shaped arch called the *pubic arch* is created by the ischium and the lower part of the pubic bones. A cuplike socket on the pelvis, called the *acetabulum,* is the location for the head of the femur. This is the ball-and-socket joint of the hip. As was mentioned in the section on the vertebral column, the sacrum serves as the base of the vertebral column, but it also functions as the middle portion of the pelvis.

Bones of the Lower Limb

The bones of the lower limb are the femur (in the upper leg, or thigh), the tibia and fibula (lower leg), and the patella (kneecap). The following drawing shows the features and bony landmarks of these bones.

BONES OF THE LOWER LIMB—THREE VIEWS

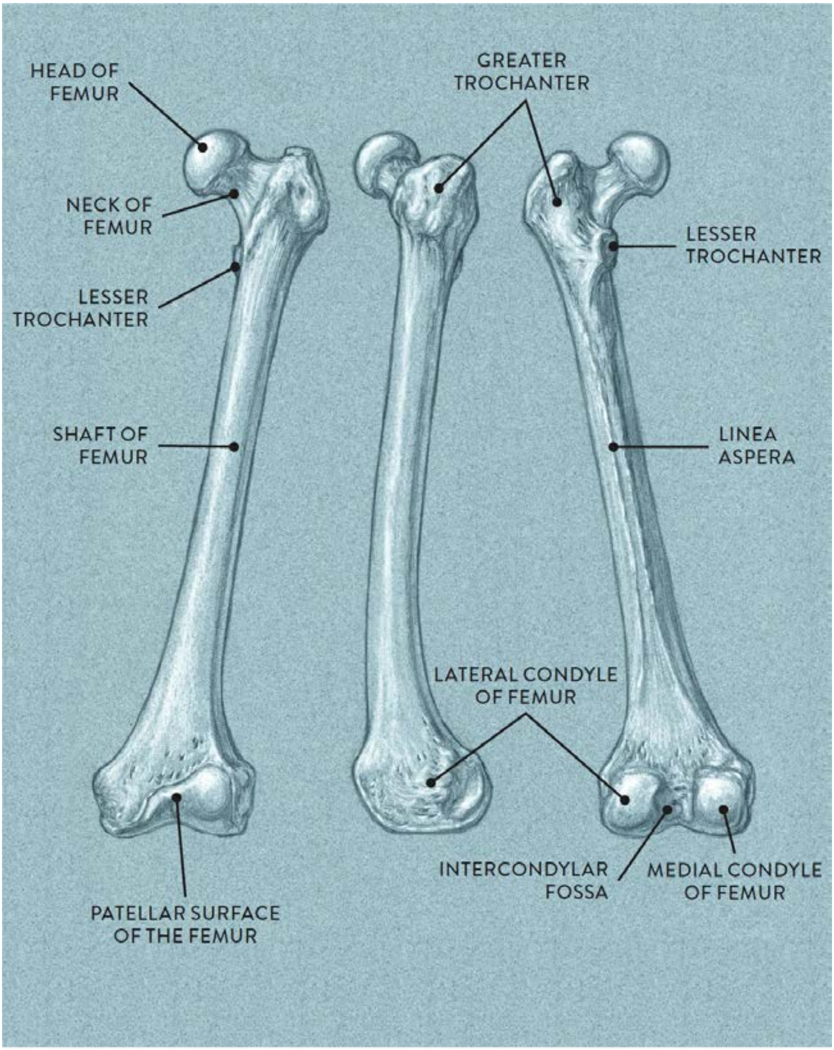


LEFT: Left lower limb, lateral view

CENTER: Left lower limb, anterior view

RIGHT: Left lower limb, posterior view

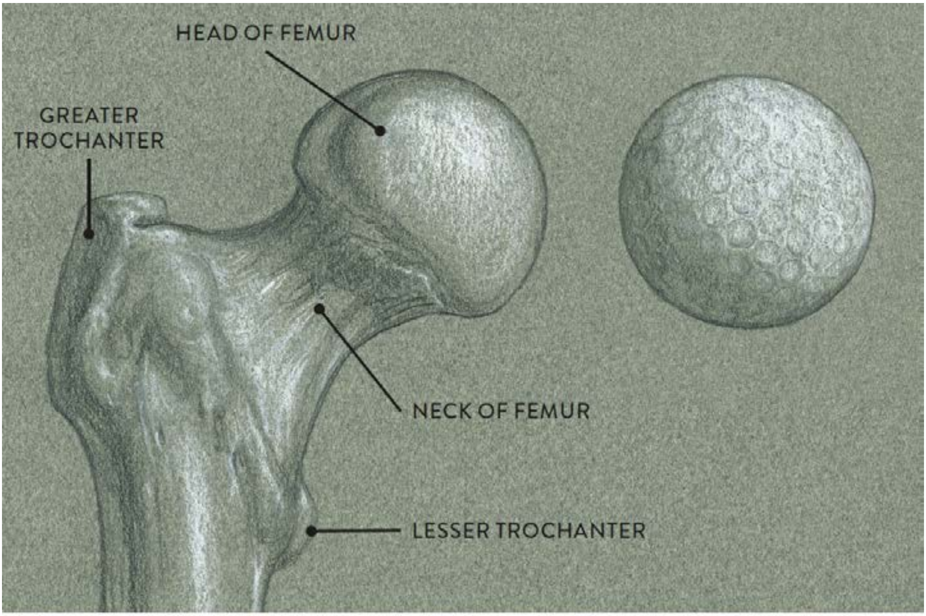
The upper leg consists of a large, elongated bone called the *femur* (pron., FEE-mur), sometimes referred to as the thigh bone. Three views of the femur are shown next.



Upper left leg, anterior view | Upper left leg, lateral view | Upper left leg, posterior view

The femur shaft descends at a slight angle within the thigh. It is smoother on the front (anterior) region, looking much like a large stalk of bamboo. On the back of the femur, however, there is a craggy vertical ridge called the *linea aspera.* Various muscles of the upper leg attach along this long ridge. At the upper portion of the femur is the *head of the*

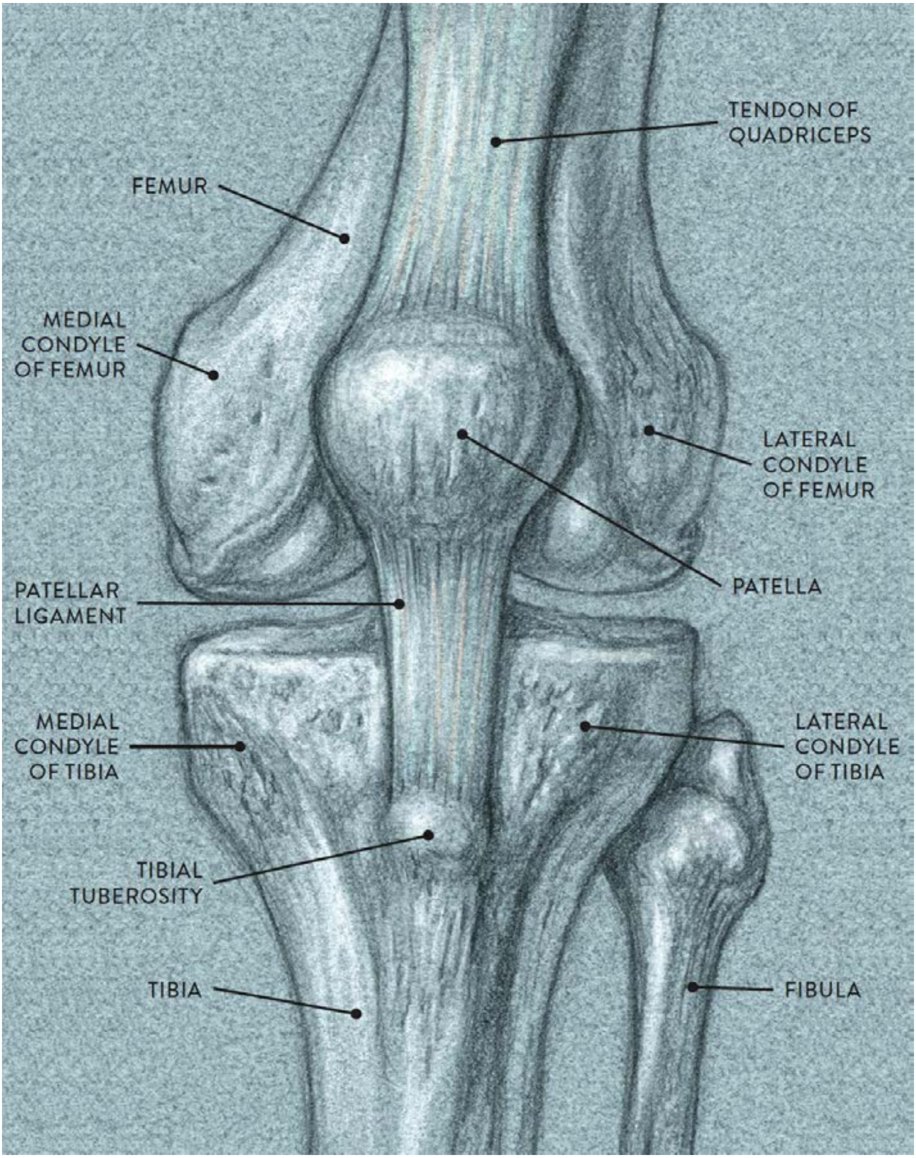
femur, which is shaped like a golf ball, as shown in the next drawing. It fits inside the cuplike socket (acetabulum) of the pelvis. The *neck of the femur* is an extension of bone projecting at a tilt from the head of the femur. The head and neck of the femur are not visible on the live model because of the multiple layers of ligaments and muscles in the region.



Upper portion of right femur, anterior view

Golf ball

As the neck joins the shaft of the femur, the bone becomes a large, textural mass called the *greater trochanter*. On the surface of the greater trochanter is a series of bumps and ridges, which are attachment sites for the gluteal muscles of the hip region. In certain positions of the upper leg, the greater trochanter can occasionally be seen as a large bump on the side of the hip of a live model. In other views, the bump of the greater trochanter is hidden because of the gluteal muscles converging in this region, and a large depression in the skin will appear instead. Below the greater trochanter but on the opposite side of the femur shaft is a small projection of bone called the *lesser trochanter*. This form, an attachment site for muscles, cannot be located on the surface form.

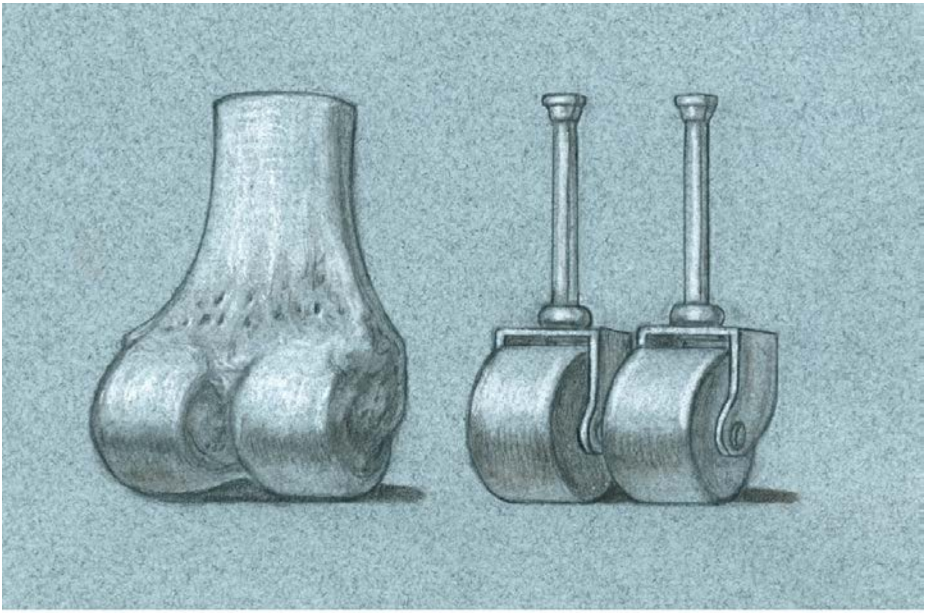


Left knee region, anterior view

At the base of the femur are two massive expansions of bone, called the condyles. The outer one is called the *lateral condyle of the femur,* and the one on the inner side is called the *medial condyle of the femur.* The condyles are slightly flat on their sides, yet

very knoblike in the back, where they have the appearance of two caster wheels, as shown in the following drawing. When the knee bends, these forms roll on top of the tibia, much like wheels. While the condyles are harder to detect in the standing leg, the upper portions of the femur's condyles can usually be detected on a live model when the legs are bent, as in a sitting pose. In an anterior view of the femur bone, the condyles are separated by a smooth surface called the *patellar surface of the femur,* which articulates with the patella. In a posterior view, the two condyles are separated by a large depression called the *intercondylar fossa.*

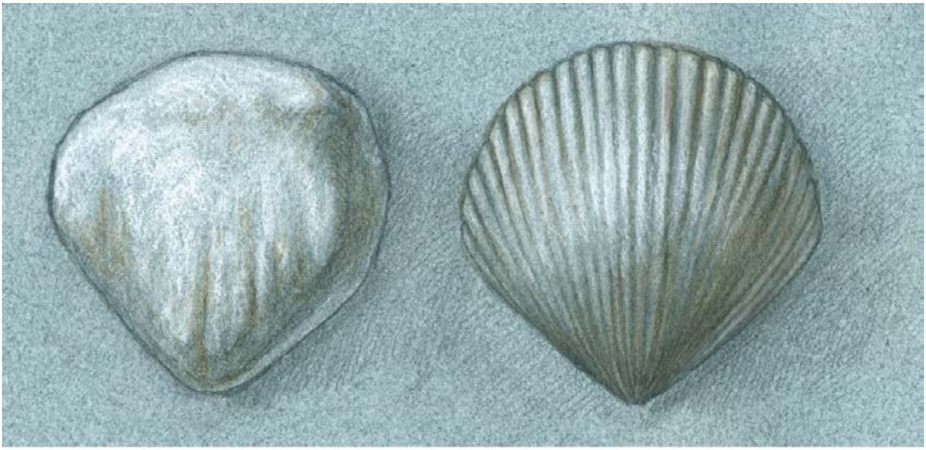
THE CONDYLES OF THE FEMUR RESEMBLING A PAIR OF CASTERS



Condyles of the femur, posterior three-quarter view

Pair of casters

THE PATELLA RESEMBLING A SCALLOP SHELL

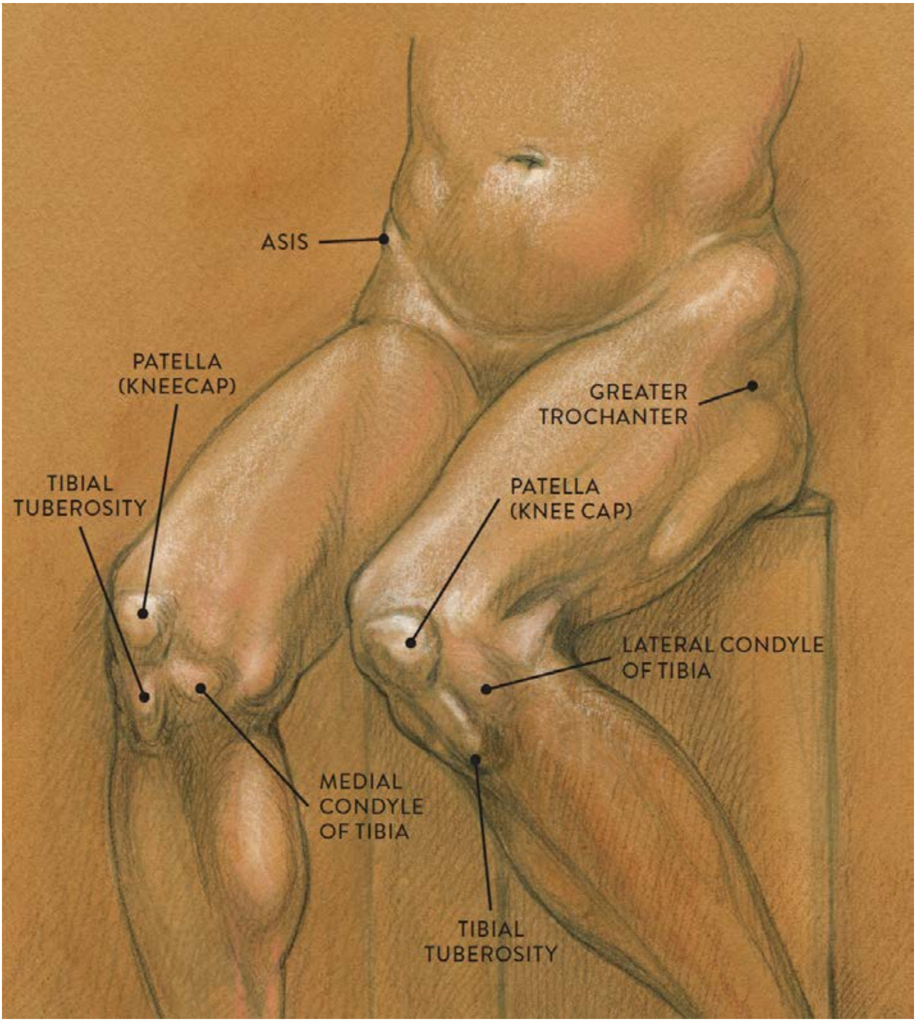


Patella Scallop shell

The *patella,* or kneecap, is a small, somewhat triangular bone that resembles a scallop shell, as shown.

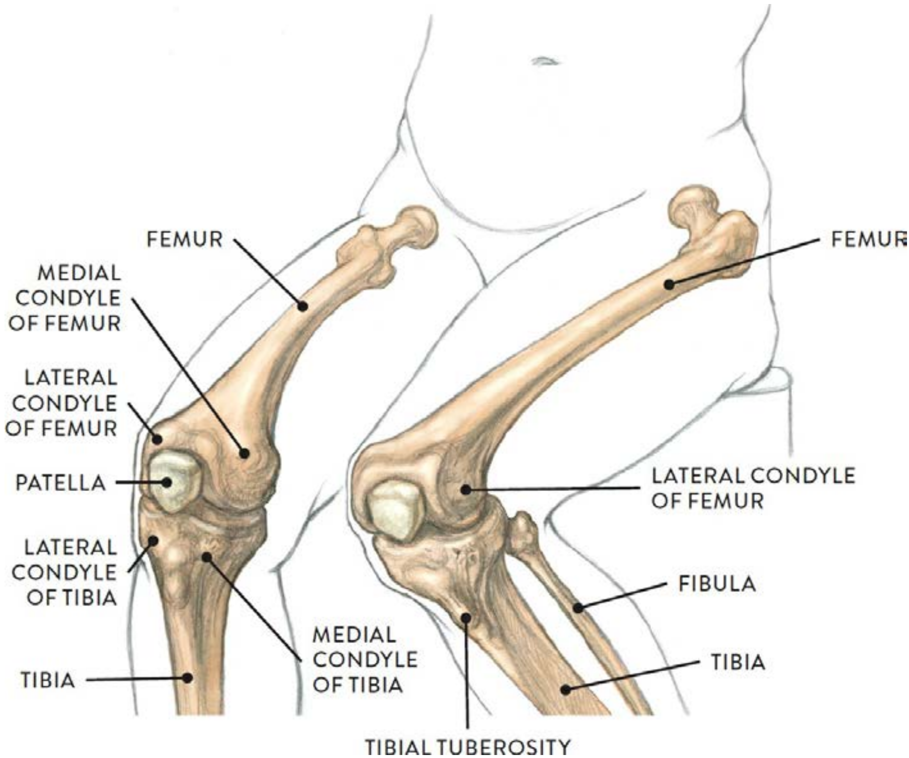
It is the human body's largest *sesamoid bone*—meaning a bone that is encased within a tendon (in this case, the tendon of the quadriceps muscles). On a living model, the top ridge of the patella can appear as a small shelf that catches light; this ledge grows more noticeable when the knees are flexed dramatically, as in a squatting pose. As a sesamoid bone, the patella helps reduce the friction between the femur and the tendon of the quadriceps during knee flexion. The patella also serves as a protective shield for the exposed bottom portion of the femur when the leg is bent. As the lower leg bends or flexes, the patella glides slightly downward. It can be seen in front, three-quarter, and side views of the leg.

The life study shown next, showing the lower torso of a seated figure, indicates the prominent landmarks of the knee region. The accompanying skeletal diagram shows the positions of the bones in the same pose.

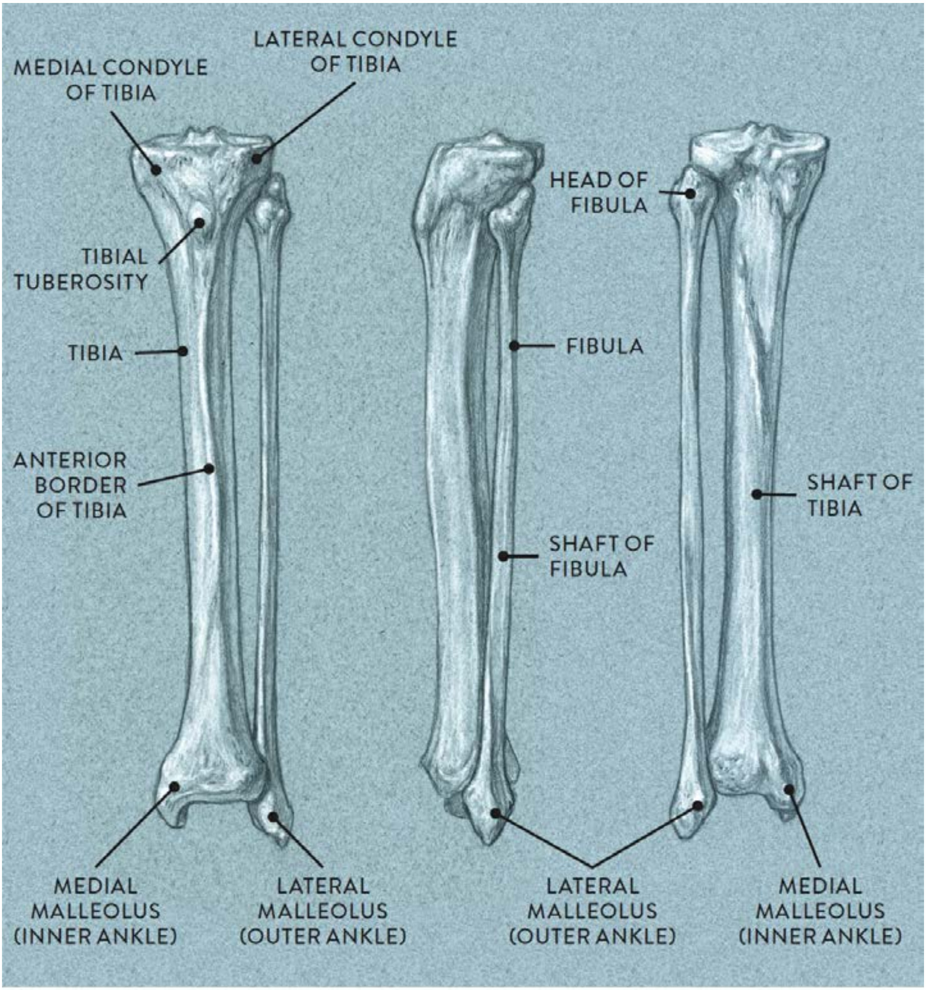


Graphite pencil, ballpoint pen, pastel, watercolor wash, and white chalk on toned paper.

Shown in the following drawing are two bones in the lower leg: the larger one is the tibia, and the slender one positioned next to it is called the fibula. Unlike the two bones of the lower arm, these bones never cross over each other. The fibula is always positioned in the outer region of the lower leg.



The *tibia,* or shin bone, is the second largest bone in the body, after the femur. At its upper frontal region are the *medial and lateral condyles of the tibia.* They appear as a singular, triangular shape with a small bony protrusion, called the *tibial tuberosity,* located at the inverted apex of this bony triangle. The tibial tuberosity is the attachment site for the *patellar ligament.* On the front shaft of the tibia is a sharp, curved edge called the *anterior border of the tibia.* It is usually seen as a slight curve beginning near the medial (inner) condyle and descending toward the inner ankle. The curve is accentuated by the tibialis anterior muscle (the muscle on the front of the tibia), which runs obliquely down the shaft of the tibia. At the lower end of the tibia is part of the ankle joint, which contains a blunt projection of bone on the inner side of the tibia called the *medial malleolus,* commonly known as the inner ankle.



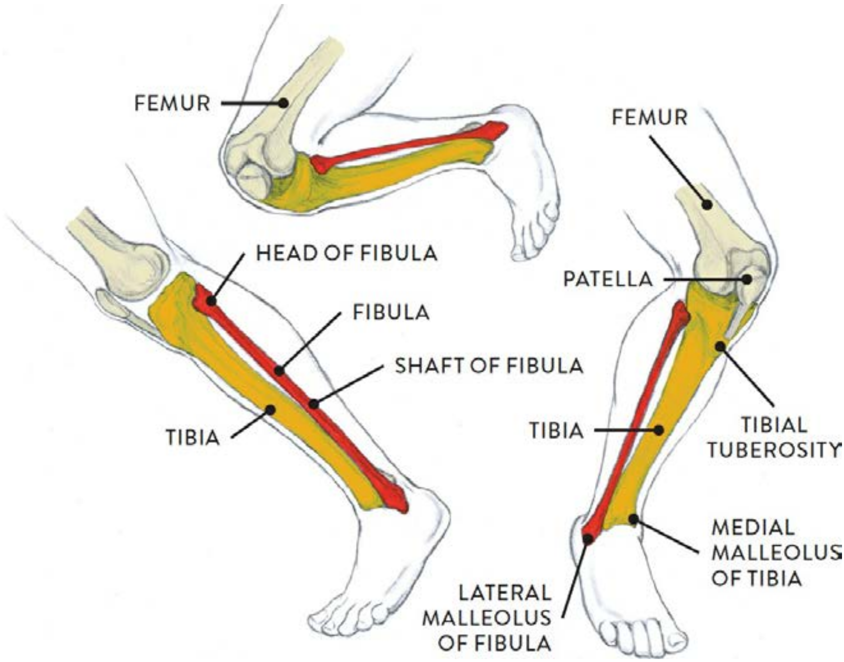
Lower left leg, anterior view | Lower left leg, lateral view | Lower left leg, posterior view

The *fibula,* or calf bone, is the slender bone alongside the tibia and serves as an attachment site for various muscles. A sheetlike membrane called the *interosseous membrane* attaches between the tibia and fibula. The fibula can be thought of as a lateral strut or a flying buttress, stabilizing the ankle joint. At its upper region, the *head of the fibula,* shaped like a bony marble, is where a strong, cordlike tendon from a hamstring muscle called the biceps femoris attaches. Both the tendon and the head of the fibula can

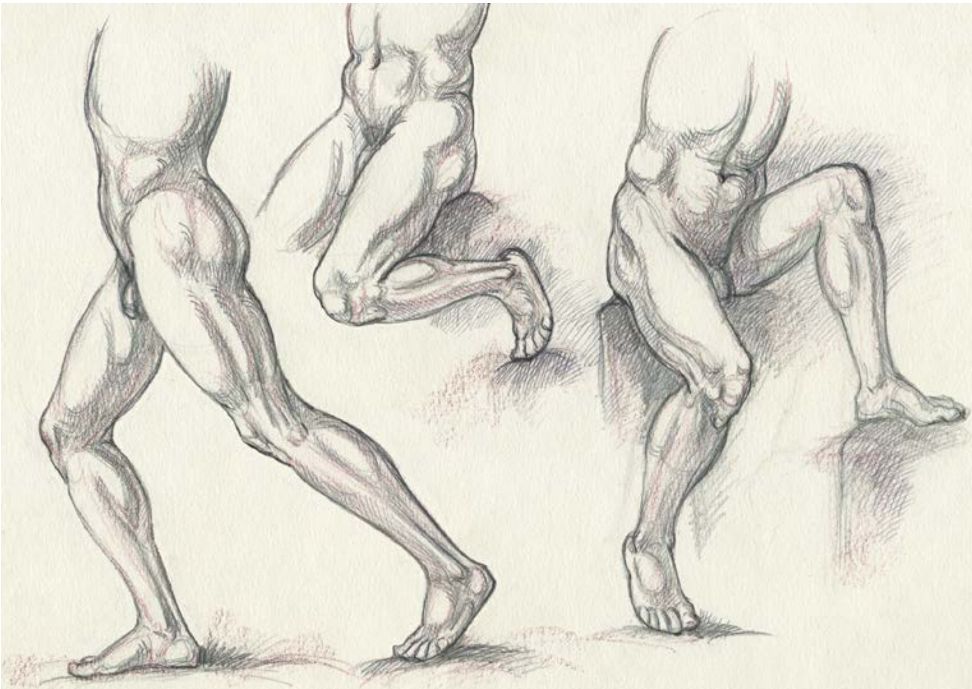
usually be seen on the live model, most notably when the lower leg is bending in a side view. As the thin and angular *shaft of the fibula* descends from the head, the bone twists vertically, adding strength to its slender form. In general, the shaft cannot be seen on the surface form because it is covered with muscles running along its length. At its base, the fibula expands into a small triangular mass called the *lateral malleolus (outer ankle),* seen as a bony landmark on a living model. When observed from the front or back, the outer ankle bone is at a lower level than the inner ankle bone of the tibia.

The sketchbook studies of the upper and lower legs and the accompanying skeletal diagram show the positions of the tibia and fibula in three different poses. Even though you cannot see the shaft of the fibula on the surface of the leg, you usually can see the head of the fibula and the outer ankle (lateral malleolus), which are at opposite ends of the fibula. Connecting these two ends in your mind helps keep you aware of the fibula's structure and placement and can help you depict the leg in a stable, realistic way.

SKELETAL DIAGRAM, SHOWING LOCATIONS OF TIBIA AND FIBULA

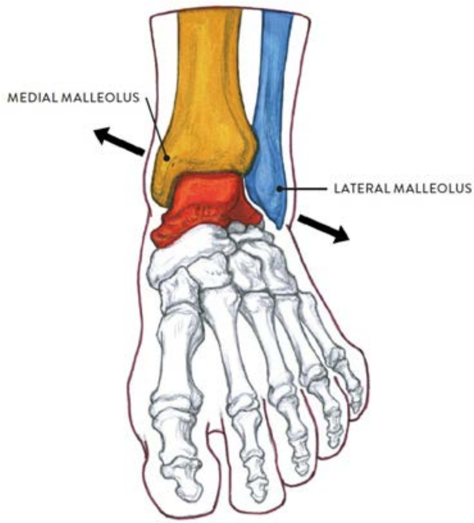


SKETCHBOOK STUDIES OF LEGS



Graphite pencil, ballpoint pen, and colored pencil on cream-colored paper.

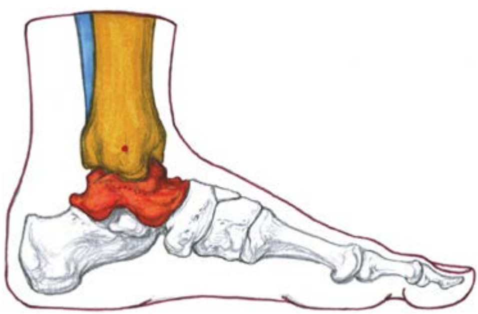
ANKLE



Medial malleolus (inner ankle)

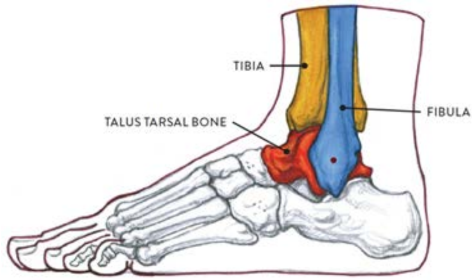
Left foot, anterior view

The medial malleolus (inner ankle) is higher than the lateral malleolus (outer ankle).



Left foot, medial view

The medial malleolus (inner ankle) of the tibia is broader and has a blunt end.



Lateral malleolus (outer ankle)

Left foot, lateral view

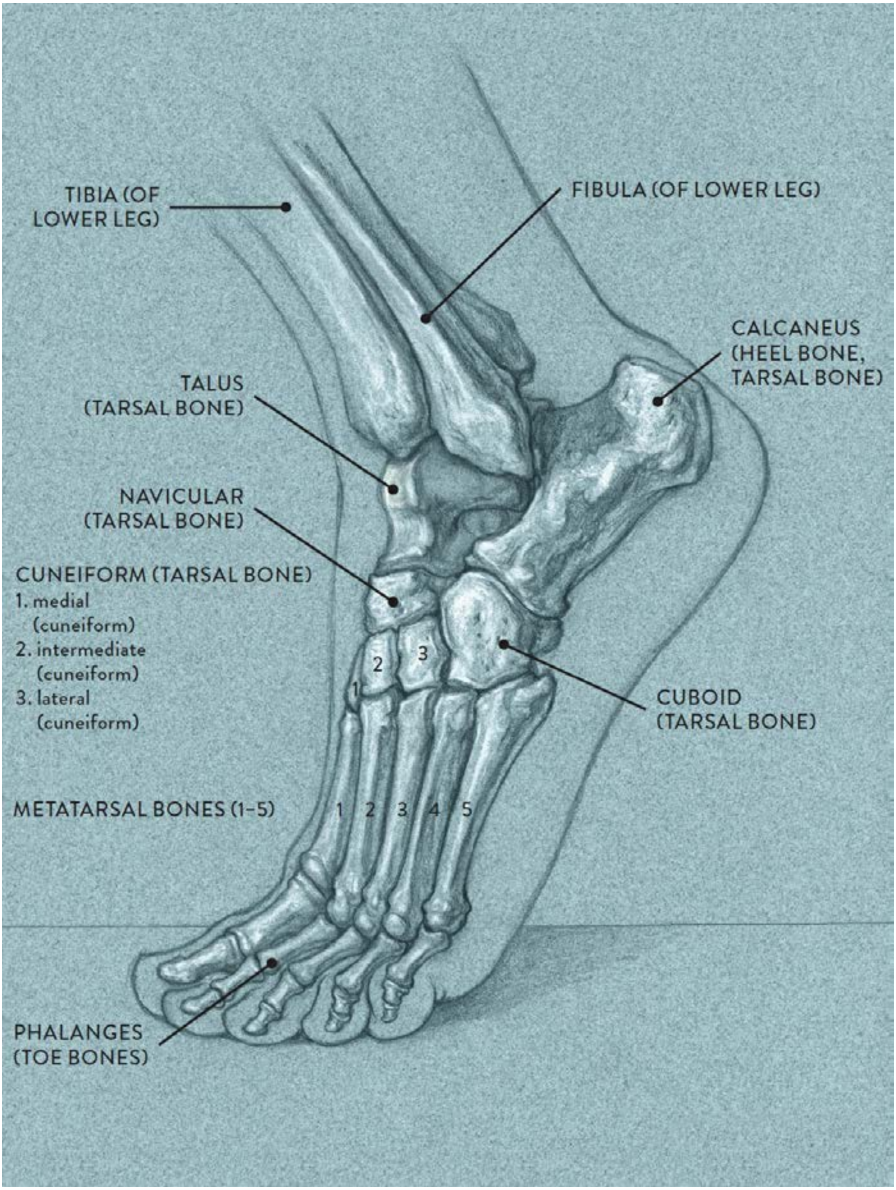
The lateral malleolus (outer ankle) of the fibula is narrower and has a tapered end.

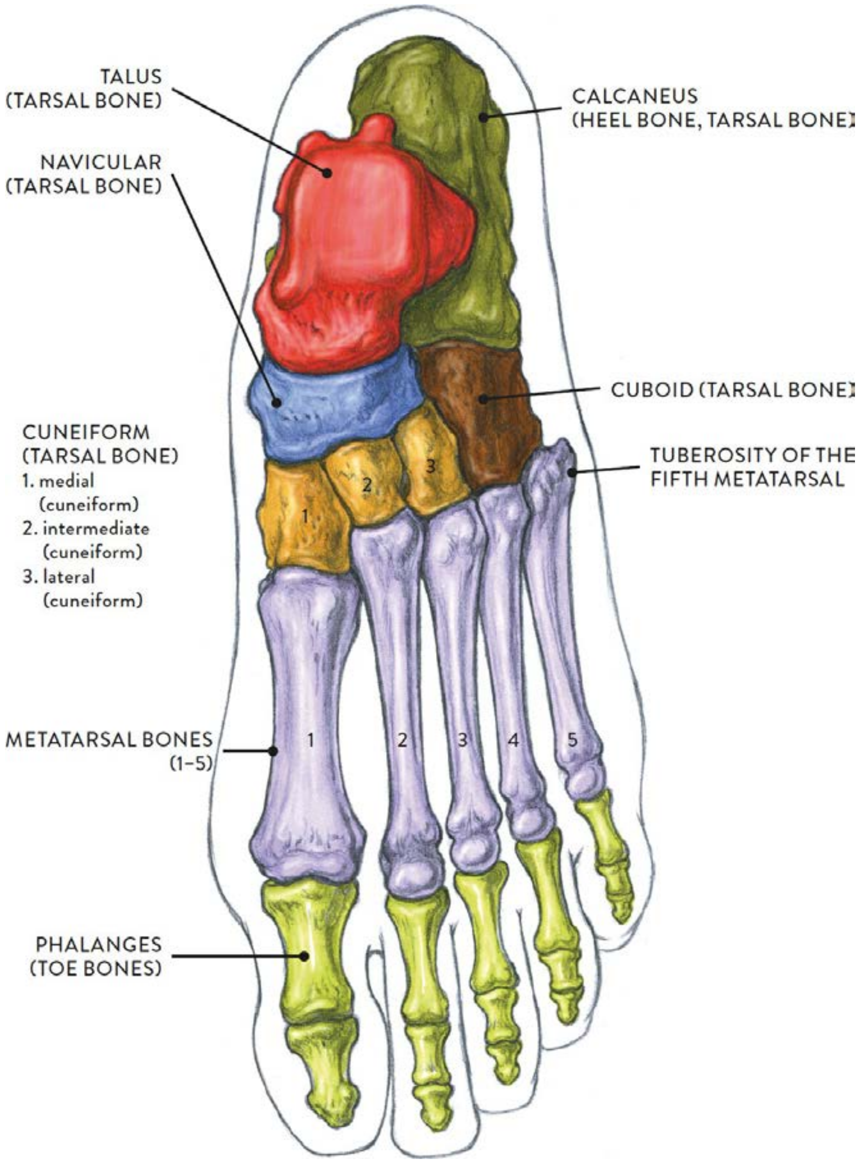
The ankle is actually made up of two different bones: the lower portions of the fibula and tibia. These forms are important bony landmarks of the lower leg and foot region and their correct placement is very important. Many beginning artists draw the ankle bones directly across from each other when seen in front or back views, but the outer ankle bone (*lateral malleolus of the fibula*) is actually lower than the inner ankle bone (*medial malleolus of the tibia*). In the lateral (outer) side view of the foot, the outer ankle bone appears lean, with a tapered end. On the medial (inner) side view of the foot, the inner ankle bone appears broader, with a blunt end. All these features of the ankle are shown in the drawings above.

Bones of the Foot

The bones of the foot belong to three groups—the tarsal bones, the metatarsal bones, and the phalanges (toe bones)—and are similar in structure to the bones of the hand. All the bones composing these three groups can be seen in the following drawings.

BONES OF THE FOOT—LATERAL VIEW





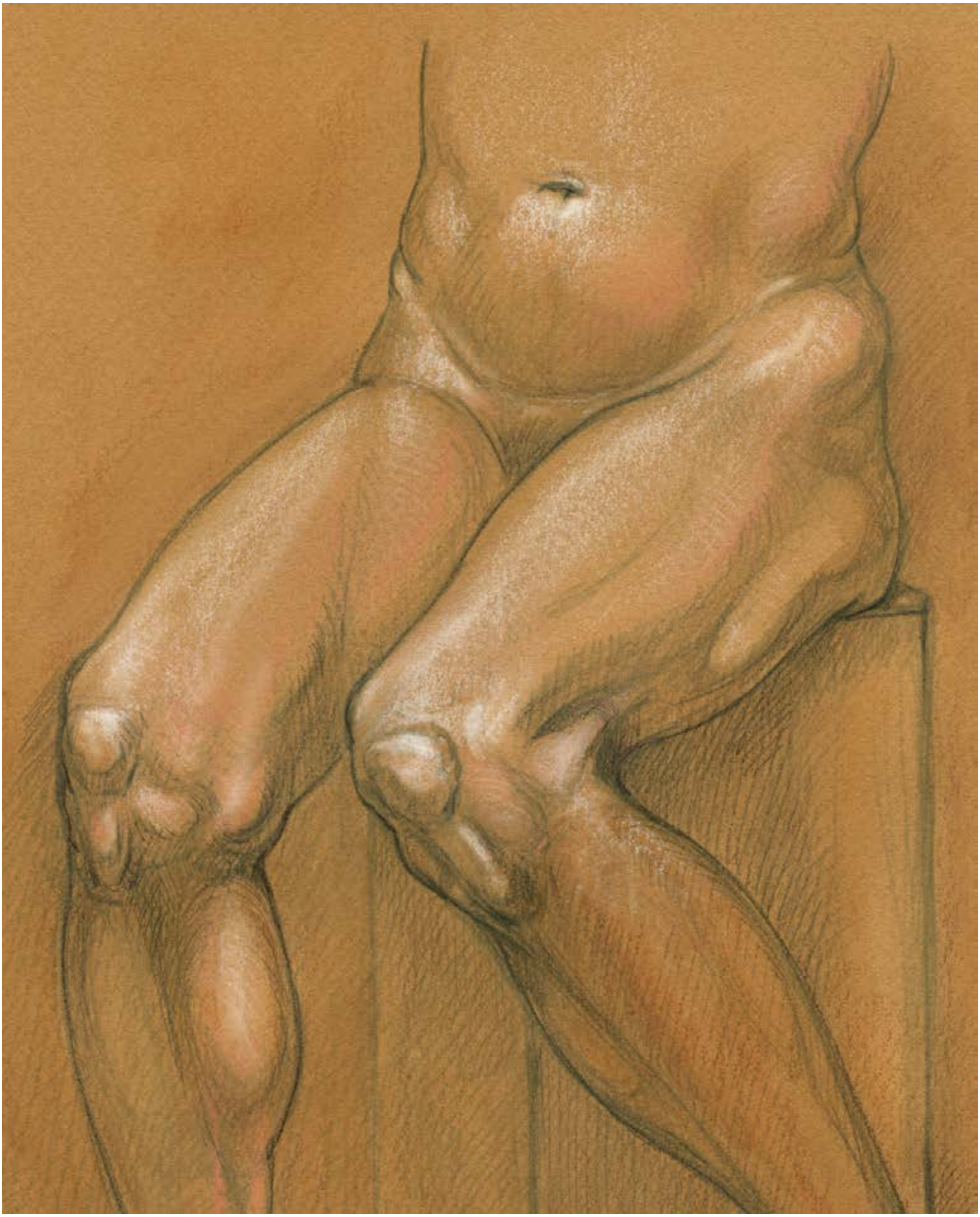
Tarsal bones is the collective term for the group of seven bones of the foot (comparable to the carpals of the hand) that form the posterior half of the foot, also called the hind foot. Directly beneath the two bones of the lower leg (tibia and fibula) is the second-largest tarsal bone, called the *talus*. These three bones (tibia, fibula, and

talus) form the ankle joint.

The *calcaneus,* commonly known as the heel bone, is the largest tarsal. Only a small portion of the heel bone can be seen on the living model because it is mostly covered with muscles and layers of fibrous-fatty tissue. It is sometimes noticeable directly below the attachment of the Achilles tendon. The other tarsal bones are the *navicular, cuboid,* and three bones sitting side by side, called the *cuneiform* bones.

Positioned between the tarsal bones and the phalanges are five elongated bones called the *metatarsals*. Each has a shaft with a base and head at opposite ends. These bones, along with some of the tarsal bones, help form the general arch of the foot. The heads of the metatarsals might appear on the surface as small bony bumps when the toes are dynamically flexing or curling. The medial (inner) surface of the *first metatarsal* (of the large toe) can be seen as a slight ridge long the inner side of the foot. On the *fifth metatarsal* (of the little toe) is a small projection called the *tuberosity of the fifth metatarsal*. Sometimes this will be seen as a small bump midway along the outer edge of the foot.

The *phalanges* (sing., *phalanx*) are the toe bones. The great toe has two individual bones, while each of the lesser toes has three individual bones. The phalanx closest to the toe's attachment on the foot is called the *proximal phalanx*; the farthest away is called the *distal phalanx*; and the intermediate phalanges on the four lesser toes are known as the *middle phalanges*. The joints of the first two toes can usually be detected because of these toes' size and length. On the other toes it is harder to see any evidence of the bones, since they are mainly obscured by fatty tissue on the toes' sides and bottoms.



STUDY OF SEATED LEGS IN THREE-QUARTER VIEW

Graphite pencil, ballpoint pen, pastel, watercolor wash, and white chalk on toned paper.

Chapter 2

Joints and Joint Movement

To fully understand movement, artists need to become familiar with the mechanics of the joints. While muscles are important because they are responsible for moving the bones, the joints play a vital role in the movement of the human figure—its limitations as well as its capabilities. This chapter focuses on the various joints and their movements.

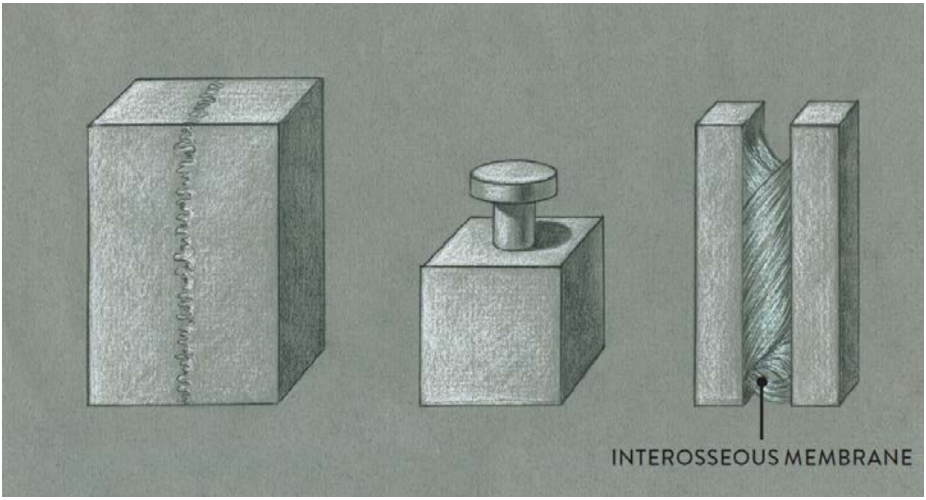
Basic Joint Types

The are three basic types of joints—*fibrous, cartilaginous,* and *synovial.* Of these, the synovial joints are of the greatest interest to artists, but let's take a brief look at the other two types before turning our attention to the several different categories of synovial joints.

Fibrous Joints

Fibrous joints are held together with fibrous connective tissue. There are three different types of fibrous joints, shown in the drawing at right: *suture joints, gomphosis joints,* and *syndesmosis joints.* Suture joints are fused, immovable joints with a zigzag appearance; examples are the suture joints of the cranium. Gomphosis joints (pron., gom-FOH-sis) are immovable joints in which a peglike structure fits into a socket; examples are the gomphosis joints of the teeth, each of which is individually rooted in a tooth socket. Syndesmosis joints (pron., SIN-dez-MOH-sis) are capable of slight movement because the fibrous connective tissue (*interosseous membrane*) that binds the bones together is slightly longer than that of the other two fibrous joints. Syndesmosis joints are found between the ulna and radius bones of the lower arm and the tibia and fibula bones of the lower leg.

FIBROUS JOINTS—THREE TYPES



LEFT: Suture joint

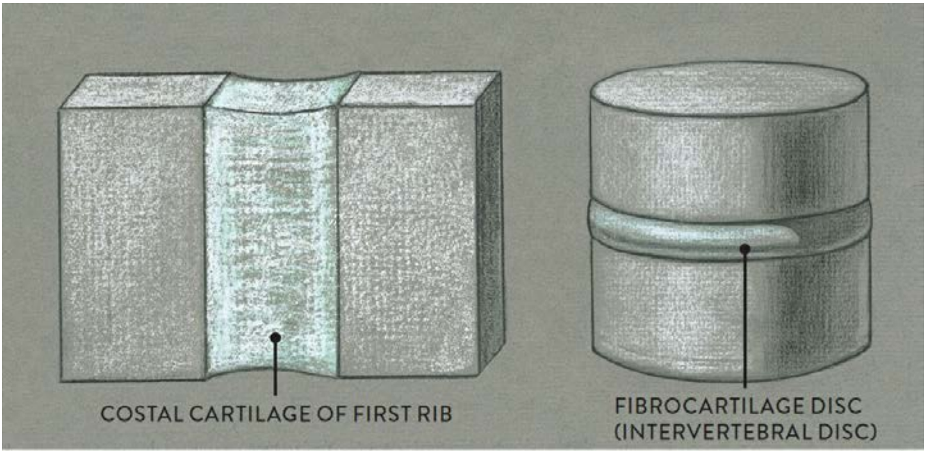
CENTER: Gomphosis joint

RIGHT: Syndesmosis joint

Cartilaginous Joints

Cartilaginous joints (pron., KAR-tih-LAAJ-ih-nuss) are connected together with a cartilage-like connective tissue, usually in the form of a fibrocartilaginous disc. There are two different types of cartilaginous joints: *synchondrosis joints* and *symphysis joints.* Synchondrosis joints (pron., sin-kon-DROH-sis) are immovable; an example is the joint between the first costal cartilage of a rib and the sternum. Symphysis joints (pron., SIM-fih-sis) are slightly movable and are located on the midline (medial line) of the body. Examples are the joints between the vertebrae (*intervertebral disc joints*), which have small fibrocartilage pads called *intervertebral discs,* and the joint between the pubic bones, called the *pubic symphysis.*

CARTILAGINOUS JOINTS—TWO TYPES



LEFT: Synchondrosis joint

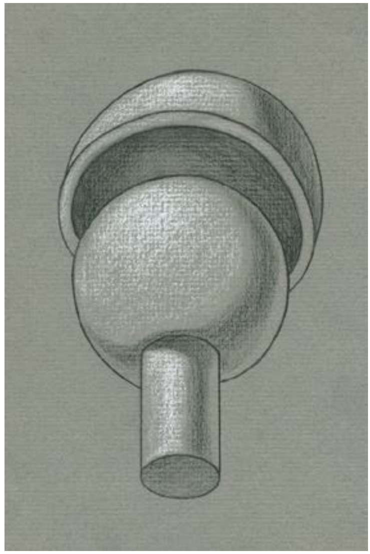
RIGHT: Symphysis joint

Synovial Joints

Also called movable joints, synovial joints (pron., sih-NO-vee-al) are essential for artists to know because of the tremendous variety of movement possibilities they enable. The outer ends of the bones that articulate with each other in synovial joints have a protective coating of *articular cartilage* to reduce friction and minimize wear and tear during movement. These joints are also encapsulated in an outer layer of fibrous tissue (mainly ligaments) and an inner layer called the *synovial membrane.* The synovial membrane contains *synovial fluid,* which functions as a lubricant for the joint. This entire structure is called the *joint capsule.* Joint capsules are found only at the synovial joints.

Each of the various types of synovial joints—ball-and-socket, hinge, pivot, saddle, gliding/plane, and ellipsoid/condyloid—produces a distinctive kind of movement, as can be seen in the drawings here.

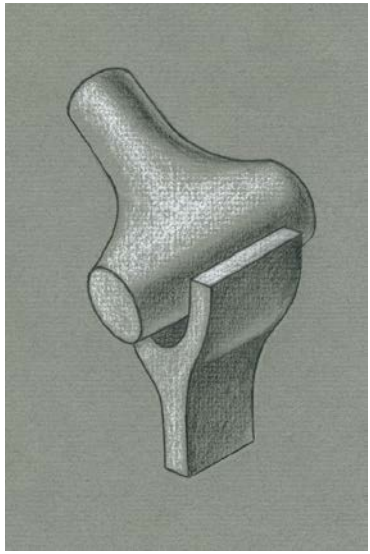
BALL-AND-SOCKET JOINT



In a ball-and-socket joint, a ball-shaped head on one bone fits into a cuplike socket on another bone.

A *ball-and-socket joint* is just what the term says: a spherelike structure fitting into a cuplike structure. Examples include the shoulder joint (glenohumeral joint) and hip joint (femoroacetabular joint). Of all the types of synovial joints, ball-and-socket joints have the greatest ability to move bones in many different directions.

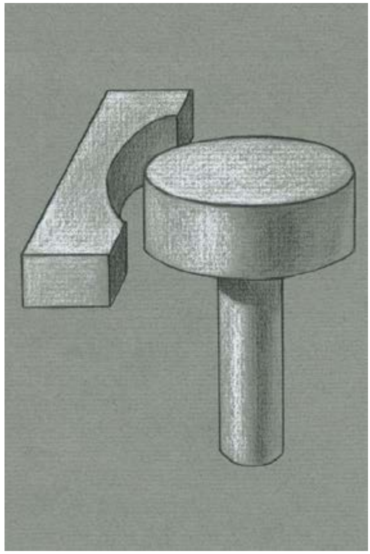
HINGE JOINT



In a hinge joint, a convex surface on one bone fits into a concave surface on another bone.

A *hinge joint* produces more limited movement, in that it can only move a bone in one direction and then return the bone back to its original position, much like the opening and closing of a door (hence the name). Hinge joints include the lower-jaw joint (temporomandibular joint, or TMJ), elbow joint (humeroulnar joint), knee joint (tibiofemoral joint), ankle joint (talocrural joint), and the finger and toe joints (interphalangeal joints). Some anatomists consider the TMJ and knee joint to be *modified hinge joints* rather than true hinge joints because subtle subsidiary movements, such as rolling and gliding of the bones, occur within these joints.

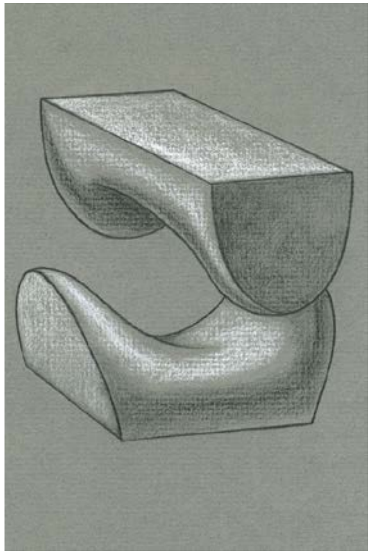
PIVOT JOINT



In a pivot joint, the rounded end of one bone rotates within a ringlike structure formed by another bone or a ligament.

A *pivot joint* has the ability to swivel a bone on its own axis—as when you shake your head "no" or turn your hand from an upward to a downward position. Joints of this type are found at the upper neck (alanto-axial joint), elbow (proximal radioulnar joint), and wrist (distal radioulnar joint).

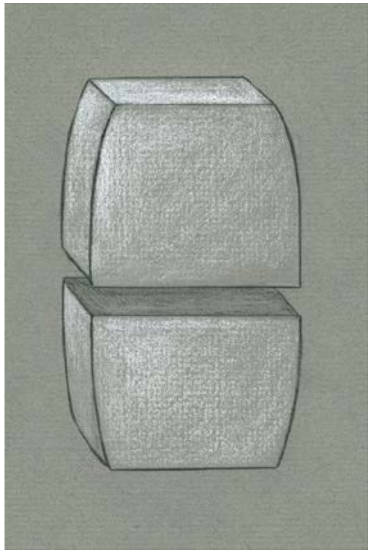
SADDLE JOINT



In a saddle joint, the two articulating ends of bones are shaped somewhat like saddles, with convex and concave surfaces, and are positioned perpendicularly, one overtop the other.

A *saddle joint* has slightly more movement than a hinge joint because of its saddlelike concave and convex articulating surfaces. The best-known saddle joint is the carpometacarpal joint at the base of the thumb, which helps move the thumb forward and back as well as across the palm, back to its normal position, and then out to the side. Some anatomists also consider the sternoclavicular (SC) joint between the inner end of the clavicle and the manubrium of the sternum to be a saddle joint.

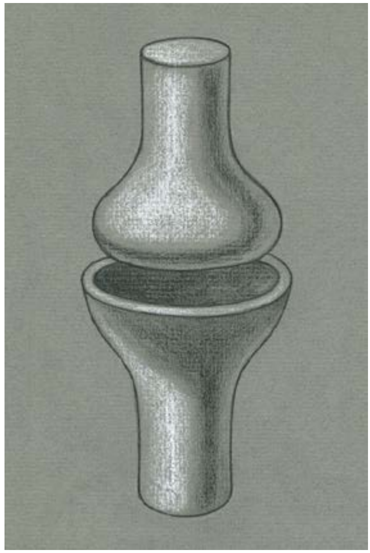
GLIDING/PLANE JOINT



In a gliding joint, two bones with flat or slightly curved surfaces glide across each other.

A *gliding joint,* or *plane joint,* has the least movement capability of all the synovial joints. As the name implies, the bones simply glide against each other. Gliding joints include the carpal joints (intercarpal joints), the tarsal joints (intertarsal joints), the carpal and metacarpal joints (CMC joints), and the pelvis joint (sacroiliac joint); they also occur between the ribs and vertebral column (costovertebral joints), the sternum and ribs (sternocostal joints), and the acromion process and clavicle (acromioclavicular joint).

ELLIPSOID/CONDYLOID JOINT



In an ellipsoid joint, the end of one bone, shaped like an elongated oval, fits into the elongated, oval-shaped cavity of another bone.

An *ellipsoid joint,* or *condyloid joint,* is similar to a ball-and-socket joint, but the shapes of the head of one bone and the socket of the other bone are more elongated—oval rather than round. Movements produced by ellipsoid joints are therefore slightly more limited than those enabled by ball-and-socket joints. Ellipsoid joints are located at the connection of the head and neck (atlanto-occipital joint), wrist (radiocarpal joint), and knuckles of the hand (metacarpophalangeal joints).

In addition to the joints described previously, there is what is called a *functional joint.* For example, the articulation between the scapula bone and the posterior portion of the rib cage is not a true joint because the scapula and rib cage are not held together with connective tissues such as ligaments, nor does it have a joint capsule. However, this articulation does *function* as a joint, hence the term.

Basic Joint Movements

Muscles contract to move bones at the joints. Movements include forward and backward motions, side-to-side motions, and rotational motions of bones or body parts. Each of these movements has a name identifying the direction of the movement. For every basic action there is a reverse action, so the terms are usually paired. For example, the torso can bend forward at the waist in the movement called flexion, then return to its original upright position in the movement called extension. In addition, most movements can be characterized as *angular, rotational, circular,* or *gliding.*

An angular movement changes the angle between two bones (increasing or decreasing the joint angle). Angular movements include flexion and extension as well as abduction and adduction.

In a rotational movement, a bone rotates on its own axis without changing its position spatially. These movements include medial and lateral rotation as well as pronation and supination.

In a circular movement (circumduction), a bone or body part produces a movement in a cone-shaped configuration, with the apex of the imaginary cone located at the joint initiating the action. In other words, one end of the bone (within the joint) is somewhat stationary while the other end of the bone moves in a circular fashion.

In gliding movements, one bone glides over another bone to produce a limited action. These movements include protraction and retraction as well as eversion and inversion.

Note that the overall movement of a joint can also include subsidiary movements in which one bone surface slides over, rolls over, or spins around another. A combination of these three types of motions can be found, to a greater or lesser degree, in all synovial-joint movements.

Anatomical Planes

To help classify the different directions of bodily movements, anatomists have formalized a system of three basic *anatomical planes* in relation to the body standing in the anatomical position—which, again, is the position of a standing figure whose head and palms of the hands are facing forward and whose weight is evenly distributed on both feet. The anatomical planes—called the *sagittal, coronal,* and *transverse planes*—are used for reference when identifying the various angular and rotational movements of the joints. Think of these imaginary planes as flat, two-dimensional spatial fields or as sheets of transparent glass slicing through the body perpendicularly to each other. Certain movements can take place only within certain planes.

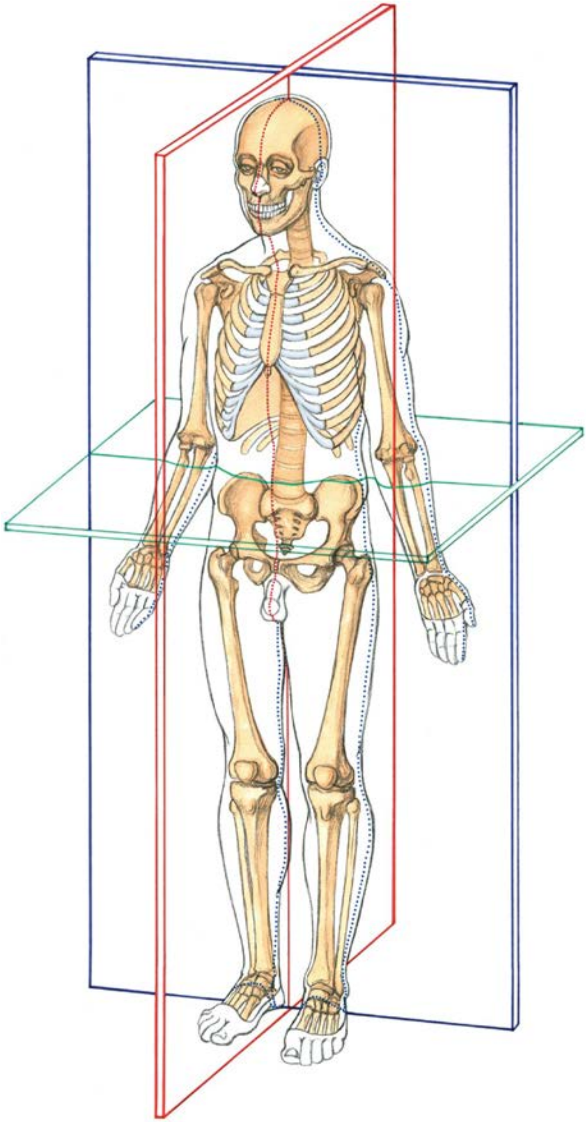
The sagittal plane divides the body vertically into equal right and left halves. Movements within the sagittal plane are *flexion* and *extension*—forward and backward movements of the head, spine, and limbs.

The coronal plane divides the body vertically into equal front (anterior) and back (posterior) portions. Movements within the coronal plane are *abduction* and *adduction* (side-to-side movements of the arms and legs), as well as *lateral flexion* (a side-to-side movement of the head, neck, or torso).

A transverse plane divides the body horizontally into upper (superior) and lower (inferior) portions. Movements within a transverse plane include the *rotation* of the head, spine, or limbs.

Although, as I say above, certain movements are restricted within the boundaries of one of these planes, many complex actions occur in two or three planes: think of a baseball pitcher moving the whole arm in a circular manner to pitch the ball, or a martial arts master executing a powerful kick.

ANATOMICAL PLANES



Anterior three-quarter view of a figure in the anatomical position

Sagittal plane

Movements in this plane are forward and backward movements of the head, spine, and limbs.

Coronal plane

Movements in this plane are side-to-side movements of the head, neck, torso, and limbs.

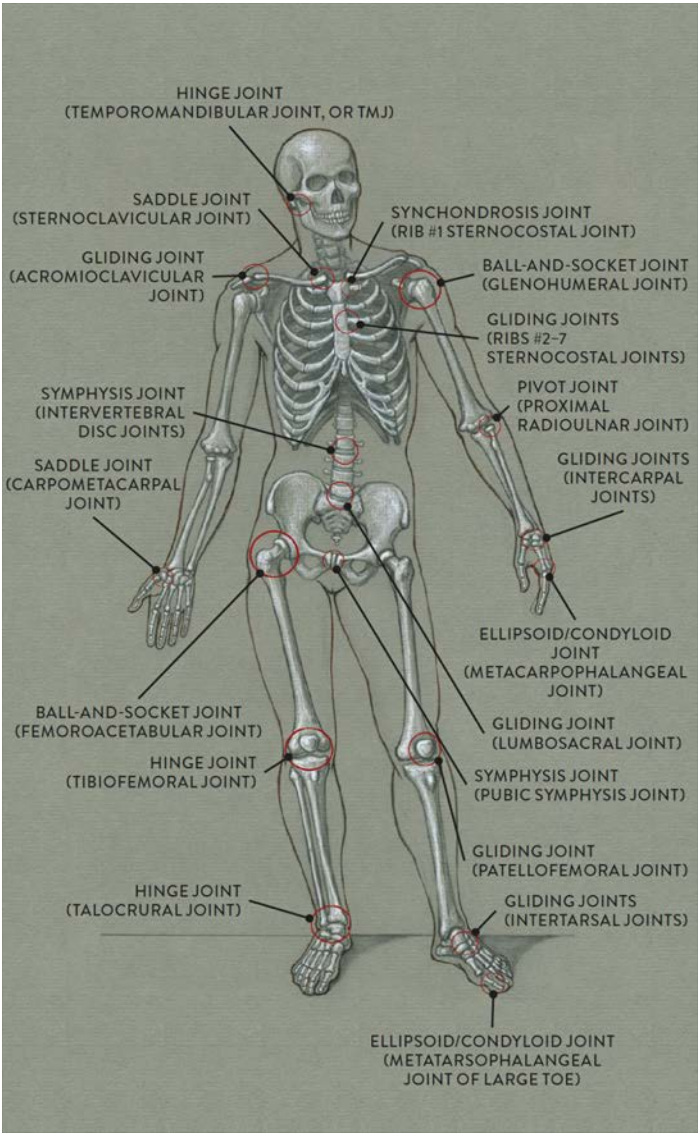
Transverse plane

Movements in this plane are rotations of the head, spine, and limbs.

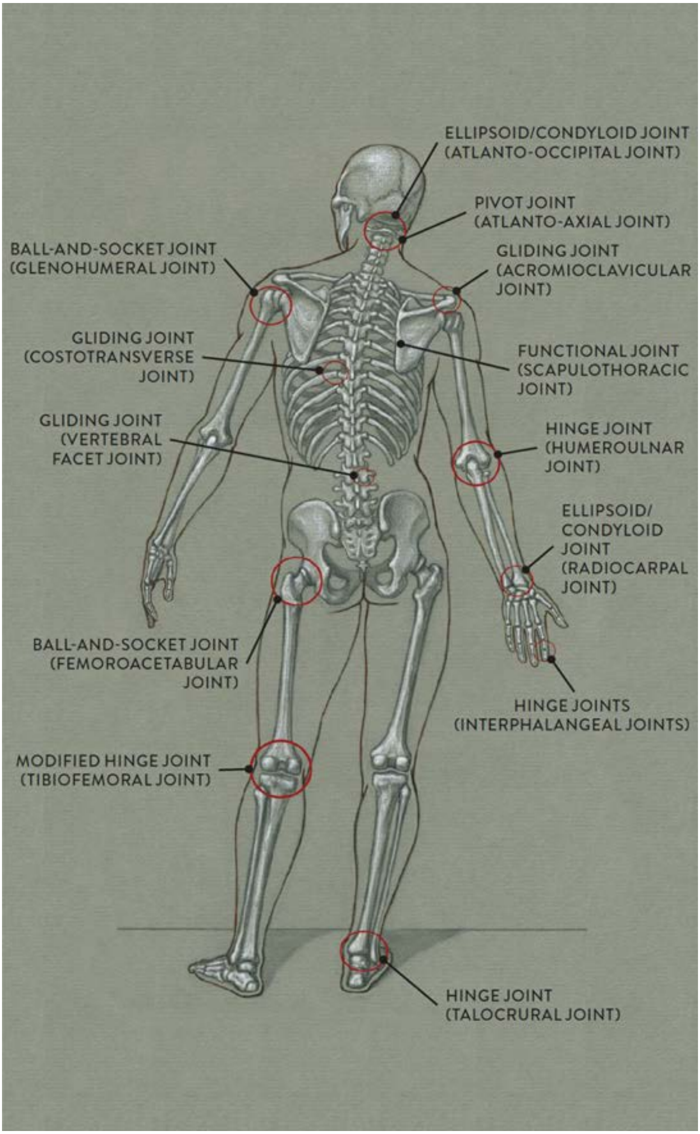
The Individual Joints of the Skeleton

We will now move through the whole skeleton and examine the main joints of each section of the body. The description of the joint will be followed by the kind or kinds of movement it produces. Locations of the most important joints and the category to which each belongs are identified in the following drawings.

LOCATION OF MAIN JOINTS OF SKELETON—ANTERIOR VIEW



LOCATION OF MAIN JOINTS OF SKELETON—POSTERIOR VIEW



Mandible Joint

All the joints of the cranium, with one exception, are suture (fused) joints, incapable of any movement. These joints are seen on skulls as zigzagging lines on the dome of the

cranium and a few of the facial bones. The only moveable joint of the cranium is the *temporomandibular joint,* or TMJ.

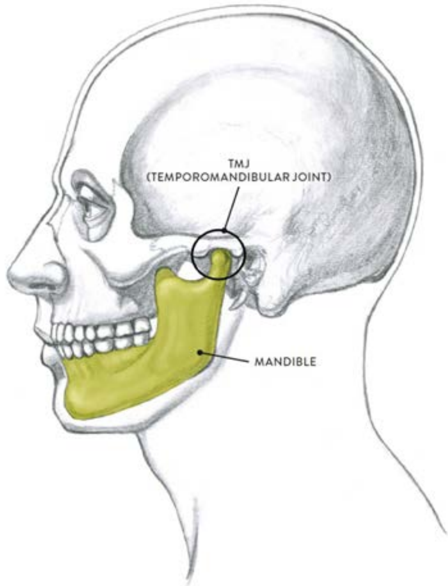
The TMJ is the articulation between the *condylar process* (a pronglike structure on the lower jaw) and the *condylar fossa* (a depression) of the temporal bone of the skull. Located directly in front of the ear, the TMJ cannot be seen on the surface, as it is covered with ligaments, muscles, and soft-tissue forms. The TMJ's appearance is similar to that of an ellipsoid/condyloid joint, but it is classified as a modified hinge joint.

The mandible is capable of three types of movement: *depression* and *elevation* (opening and closing of the lower jaw), *protraction* and *retraction* (forward and backward movement of the lower jaw), and *lateral excursion* (the side-to-side movements of the lower jaw, also known as *left and right deviation*). These jaw movements are utilized mainly for chewing and grinding food, but also in certain vocalizations when the jaw is open.

The next drawing, *Depression and Elevation of Mandible at the TMJ (Temporomandibular Joint),* shows the hinge-like movement of the jaw. Depression is the lowering of the jaw, opening the mouth wide. Elevation is the movement of returning the jaw back to its normal position. These movements are seen in various facial expressions and in vocalizations in which the jaw is dropped and mouth opened to project the voice when singing or calling out.

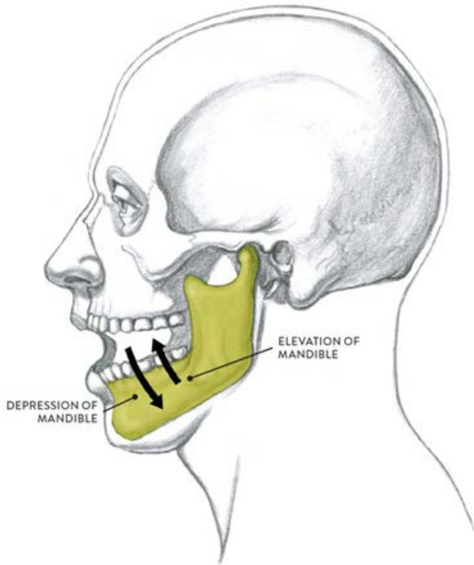
DEPRESSION AND ELEVATION OF MANDIBLE AT THE TMJ (TEMPOROMANDIBULAR JOINT)

Modified hinge joint action



Lateral view of cranium

Neutral position of mandible



Lateral view of cranium

Actions of the mandible

Joints of the Vertebral Column, Rib Cage, and Pelvis

This section covers the cervical joints of the neck, the thoracic vertebral joints of the rib cage, the lumbar joints between the rib cage and pelvis, and the lumbosacral joint of the pelvis, as well as several additional joints of the rib cage and pelvis. We will see how the joints of the cervical (neck) vertebrae move the cranium and how the joints of the thoracic and lumbar region help move the rib cage and pelvis in different directions *as whole units*.

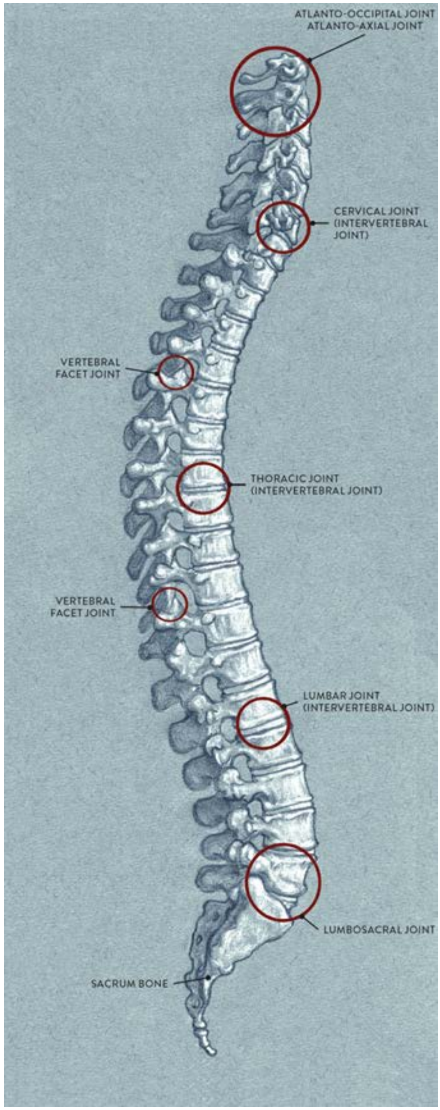
The Joints of the Vertebral Column

Most of the movement in the vertebral column occurs in the neck region (cervical vertebrae) and the small of the back (lumbar vertebrae), with minor movements occurring in the rib cage (thoracic vertebrae). The *range of motion* of the vertebral column depends on many factors: An individual's level of fitness can make a difference in the motion capability of his or her vertebral column. Athletically trained people have more flexibility in their spines than people who are sedentary. Other contributing factors include the flexibility or resistance of the muscles and ligaments of the back and the condition of the various vertebral bones and joints. Age plays a factor, with elderly people tending to lose flexibility of the vertebral column due to bone and disc

degeneration.

The joints of the vertebrae, shown in the next drawing, include both cartilaginous and synovial joints. Let’s look at the two basic vertebral joint types: intervertebral joints and vertebral facet joints.

JOINTS OF VERTEBRAL COLUMN—LATERAL VIEW



Intervertebral joints (pron., in-ter-VER-teh-brul), also called *disc joints,* are cartilaginous joints located between the drumlike shapes of the vertebrae. A fibrocartilaginous pad called the *intervertebral disc* is positioned between every two vertebrae with the exception of C1 and C2. These discs serve as protective cushions, reducing the friction between bones during joint action, and also act as shock absorbers

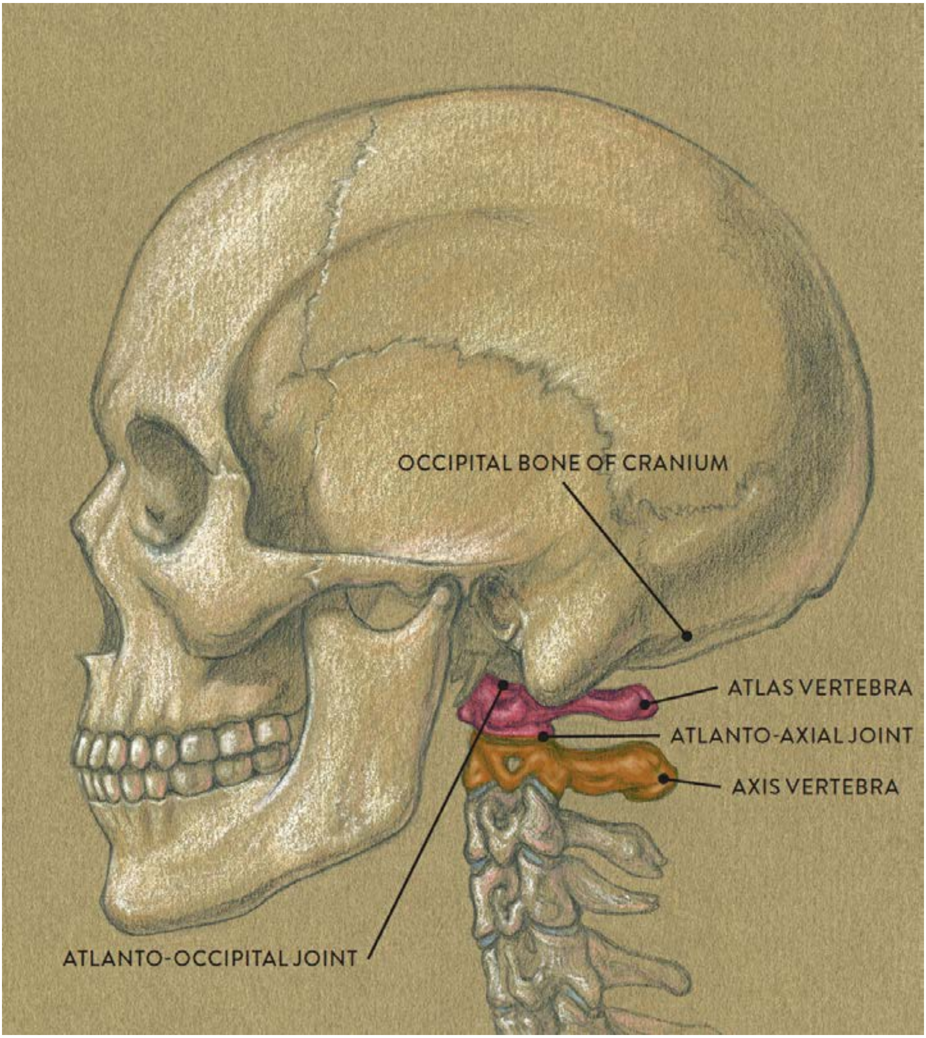
and weight-bearing structures.

Vertebral facet joints are synovial joints located on the vertebral arches. A facet on one vertebral arch articulates with a facet of the adjacent vertebral arch. These joints are considered gliding, or plane, joints.

The cervical, or neck, vertebrae play an important role not only in supporting the weight of the cranium but in allowing the head to move in different directions. The two primary joints of this region are the atlanto-occipital joint and the atlanto-axial joint.

The *atlanto-occipital joint* (pron., at-LAN-toe ock-SIP-ih-tal), or AOJ, is the joint between the occipital bone of the cranium and the first cervical vertebra (atlas, or C1). It is classified as an ellipsoid/condyloid joint. The main actions at the AOJ are flexion and extension—rocking the head back and forth, as when nodding "yes." Other actions include lateral flexion and circumduction of the head and neck.

The *atlanto-axial joint* (pron., at-LAN-toe AXE-see-al), or AAJ, is the joint between the first cervical vertebra (atlas, or C1) and second cervical vertebra (axis, or C2). The articulation occurs between the *odontoid process* (or *dens*), a small bony projection on the axis vertebra, and the inner surface of the atlas vertebra. The atlanto-axial joint, classified as a pivot joint, allows rotational movement of the head and neck, as when the head swivels to the right and left in shaking the head "no." The drawing below shows the atlanto-occiptal and atlanto-axial joints.



Lateral view of cranium and upper cervical vertebrae

Names of Vertebral Joints

The names of vertebral joints provide clues to their location:

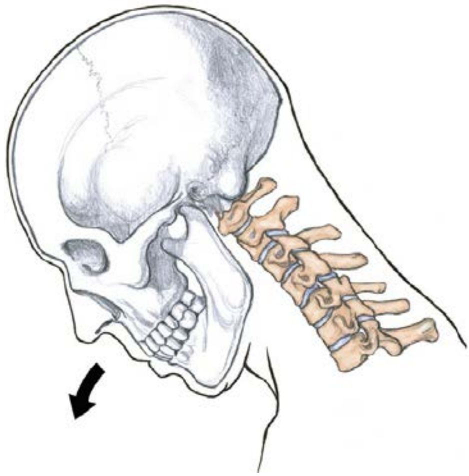
- *Occipital* pertains to the occipital region of the cranium.

- *Atlanto* pertains to the first cervical (atlas) vertebra.
- *Axial* pertains to the second cervical (axis) vertebra.
- *Costo* pertains to a rib.
- *Vertebral* pertains to the body of a vertebra.
- *Transverse* pertains to the transverse processes of a vertebra.
- *Lumbo* pertains to the lumbar vertebrae.
- *Sacral* pertains to the sacrum bone.

Now let's look at how the whole neck participates in moving the head. Movements of the neck and head include flexion and extension (bending the head and neck forward and back), lateral flexion (bending the head and neck to the side), and rotation (horizontal swiveling of the head and neck). The next drawing, *Flexion and Extension of Head and Neck at Cervical Vertebral Joints,* shows the head and neck moving in a forward and back direction. Flexion is the action of bending the head forward and downward toward a stationary rib cage, and extension is the return of the head and neck to its normal position. Bending the head back with the chin lifting upward is sometimes called *hyperextension*—that is, extending the body part beyond the normal limit.

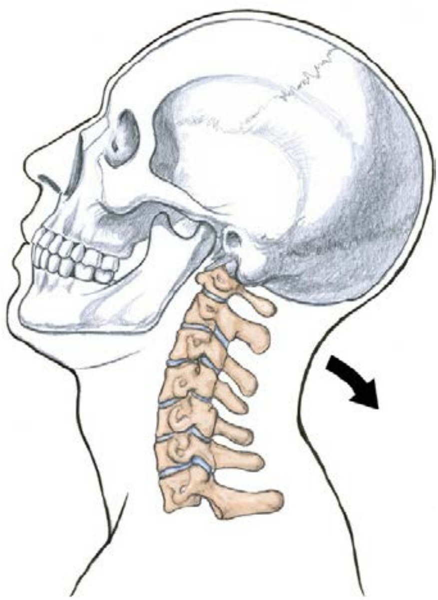
FLEXION AND EXTENSION OF HEAD AND NECK AT CERVICAL VERTEBRAL JOINTS

Gliding joint action



Flexion of head and neck

Head bends forward with chin pulling in.



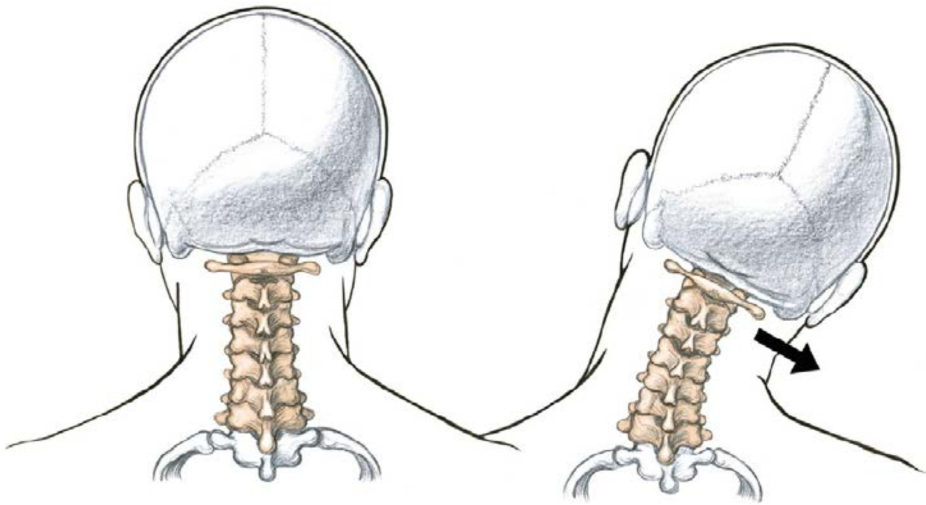
Extension of head and neck

Head bends back with chin pulling up.

In the drawing *Lateral Flexion of Head and Neck at Cervical Vertebral Joints,* we see the head and neck moving sideways. Lateral flexion is the bending of the head toward either the right or left shoulder. This action causes one side of the neck to stretch while the other side contracts.

LATERAL FLEXION OF HEAD AND NECK AT CERVICAL VERTEBRAL JOINTS

Gliding joint action



Head and neck tilt toward right shoulder. (Head can also tilt toward the left shoulder, in left lateral flexion.)

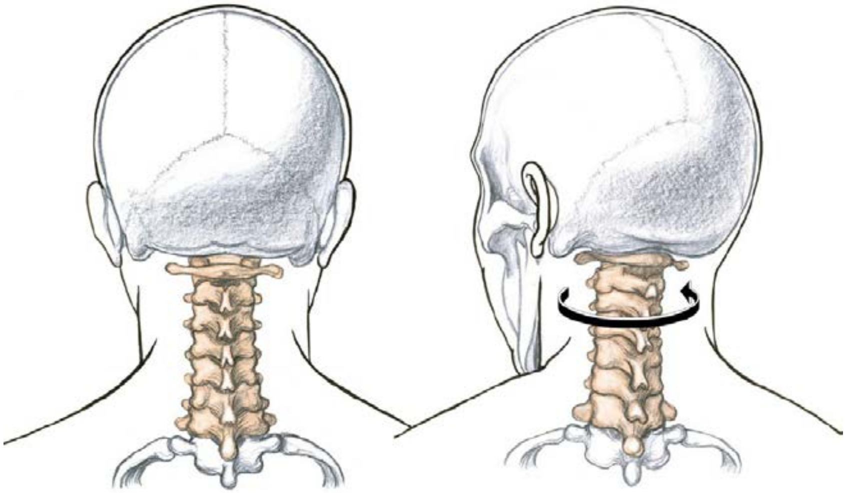
LEFT: Neutral position of head and neck

RIGHT: Right lateral flexion

Finally, in the drawing *Rotation of Head and Neck at Cervical Vertebral Joints,* shown next, we see how the head and neck swivel or turn. When the rib cage is stationary, the head and neck can rotate either to the right or to the left. There is, however a limitation in the rotational movement because of the configuration of the cervical vertebrae and the ligaments attaching to them. Ordinarily, the chin cannot move past the shoulder line; however, if the head tilts dramatically back and rotates, then the chin can move slightly past the shoulder.

ROTATION OF HEAD AND NECK AT CERVICAL VERTEBRAL JOINTS

Pivot and gliding joint action



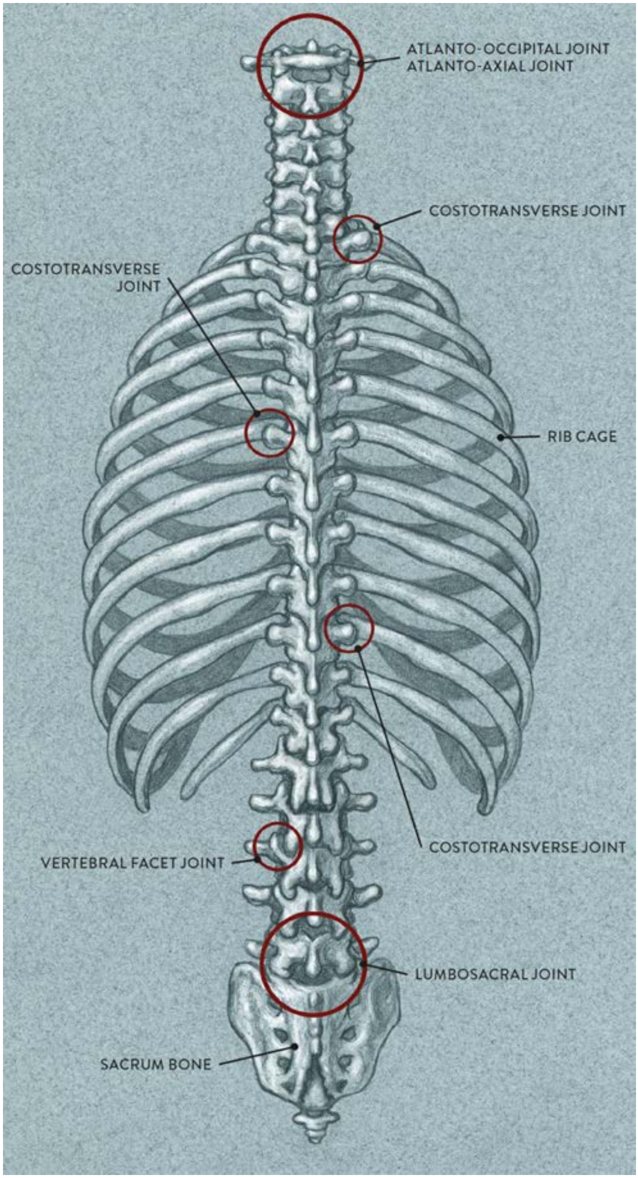
The head and neck can also rotate toward the right (right rotation).

LEFT: Neutral position of head and neck, posterior view

RIGHT: Left position of head and neck, posterior view

The Joints of the Rib Cage

The rib cage consists of twelve pairs of ribs that connect to two primary bony structures: the thoracic vertebrae (positioned in the posterior region of the rib cage), and the sternum (positioned in the anterior region of the rib cage). Note that the three pairs of false ribs do not connect directly to the sternum, and that the two pairs of floating ribs at the bottom of the rib cage do not connect to the sternum at all. Let’s look first at the connections between the ribs and the vertebral column, as shown in the drawing *Joints of Rib Cage and Vertebral Column*.



Posterior view

Throughout the vertebral column we see the numerous intervertebral joints and vertebral facet joints, as discussed above. Additional joints occur as the ribs connect

into the vertebral column. These are called the *costotransverse joints* and the *costovertebral joints*. A costovertebral joint (pron., CO-sto-VER-teh-brul) connects a rib to the drumlike body of a vertebra; this type of joint can be seen in the drawing of the anterior region of the rib cage on this page. A costotransverse (CO-sto-TRANS-verse) joint connects a rib to the transverse process of a vertebra (the horizontal bony protrusion). The term *costo* means "rib," and this prefix helps clarify that these particular joints occur only when the ribs attach *directly* into the thoracic vertebrae.

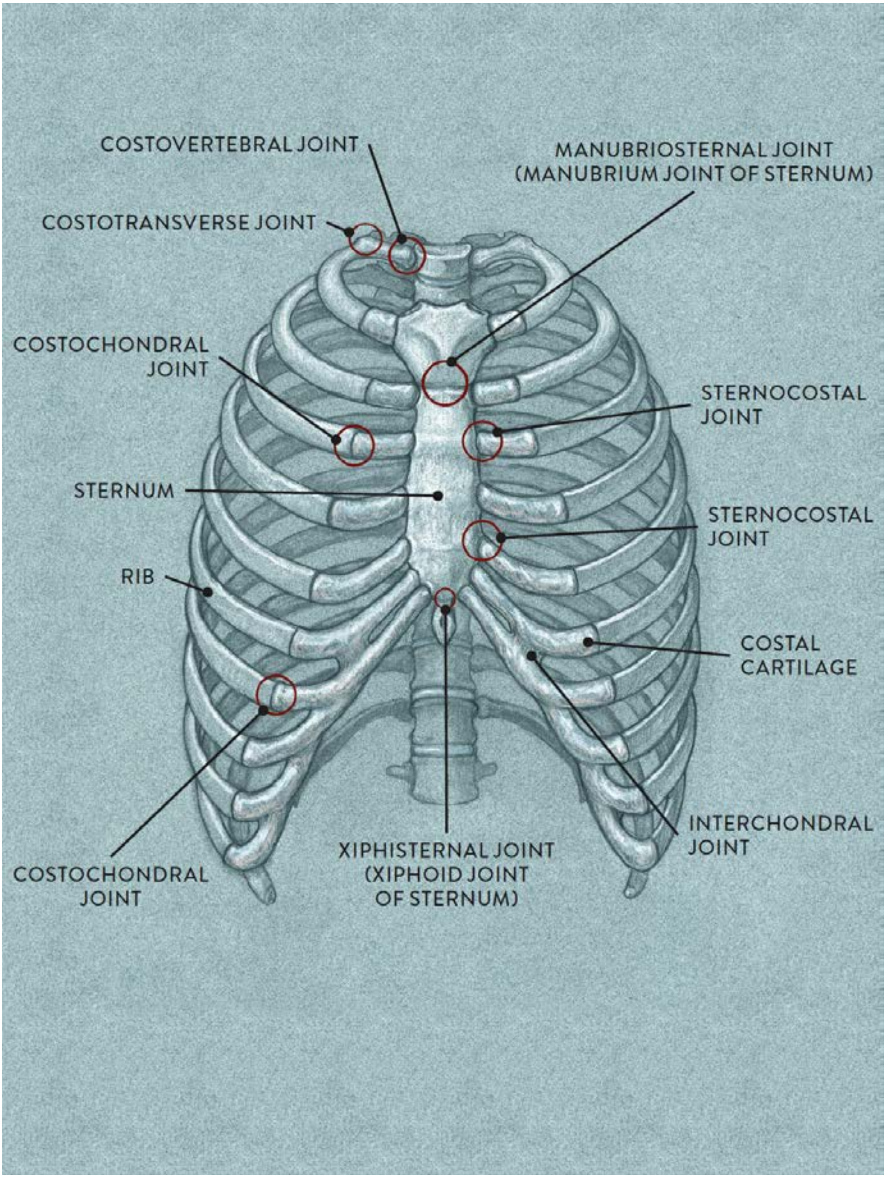
Names of Rib Cage Joints

The names of rib cage joints provide clues to their locations:

- *Costo* or *costal* pertains to the ribs.
- *Vertebral* pertains to the vertebrae.
- *Sterno* pertains to the sternum (breastbone).
- *Chondral* pertains to cartilage.

Now, let's look at the placement of the joints connecting the ribs to another primary bony structure—the sternum (breastbone), positioned in the anterior portion of the rib cage. As shown in the next drawing *Joints of Rib Cage and Sternum,* these joints are the sternocostal joints (located between cartilage and sternum), the costochondral joints (between rib and cartilage), and the interchondral joints (between cartilage sections in the thoracic arch). The sternum itself has two separate joints: the manubriosternal joint and the xiphisternal joint.

The joints between the costal cartilages of the first seven ribs and sternum are called the *sternocostal joints* (pron., STER-no-CO-stol). The articulation of the first rib and the sternum produces no movement because it is a cartilaginous joint. The joints between the sternum and ribs numbers 2 through 7 are gliding/plane joints that produce minimal gliding movements, usually not noticeable on the surface.



Anterior view

The *costochondral joints* (pron., co-sto-CON-drul) are between the ribs and the costal cartilage. Since there are no joint capsules, there is very little motion at these

joints.

The *interchondral joints* (pron., in-ter-CON-drul) are small fibrous connections between the costal cartilage in the thoracic arch region. They are considered gliding/plane joints.

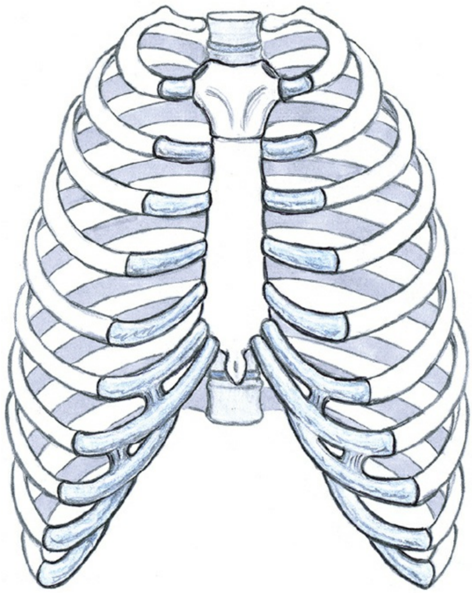
The first of the sternum joints is the *manubriosternal joint* (pron., maa-NEW-bree-oh-STERN-ul), which is between the manubrium of the sternum and the body of the sternum. It is a symphysis type of cartilaginous joint but often fuses together in middle age or later. The other sternum joint, the *xiphisternal joint* (pron., ZIF-ih-STERN-ul), is between the xiphoid process and the body of the sternum. It is a synchondrosis type of cartilaginous joint but also fuses together in middle age or later.

Movement is minimal at the rib cage joints, activated mainly during breathing. During inhalation the diaphragm contracts and moves downward to allow the lungs to expand, filling with air; the ribs are pulled slightly upward and out, much like levers, to widen the rib cage. In exhalation, the ribs, diaphragm, and lungs return to their normal position. Although these movements are subtle and hard to detect during normal breathing, you can clearly see them when watching the rib cage of an athlete after an exhausting event, such as a sprint.

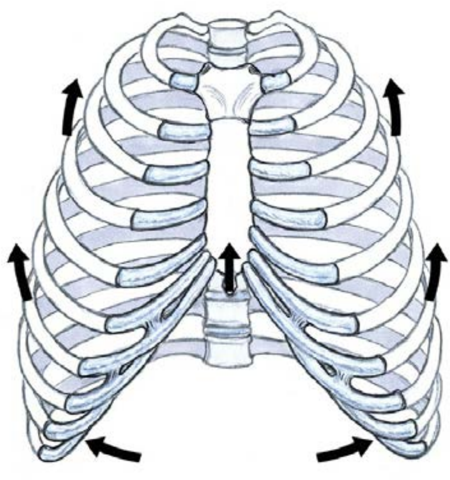
In the drawing *Rib Cage Movement during Respiration,* we see the rib cage on the left in the normal state. The middle drawing shows the rib cage immediately after inhalation, when the lungs are filled with air. On the right we see how the rib cage returns back to normal position immediately after exhalation.

RIB CAGE MOVEMENT DURING RESPIRATION

Arrows indicate directional movement within rib cage.

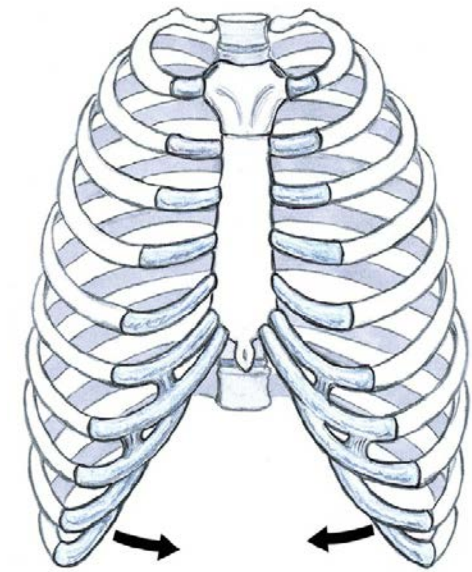


Normal position of rib cage.



The lungs fill with air.

Inhalation



Air is expelled from the lungs, and the position of the rib cage returns to normal.

Exhalation

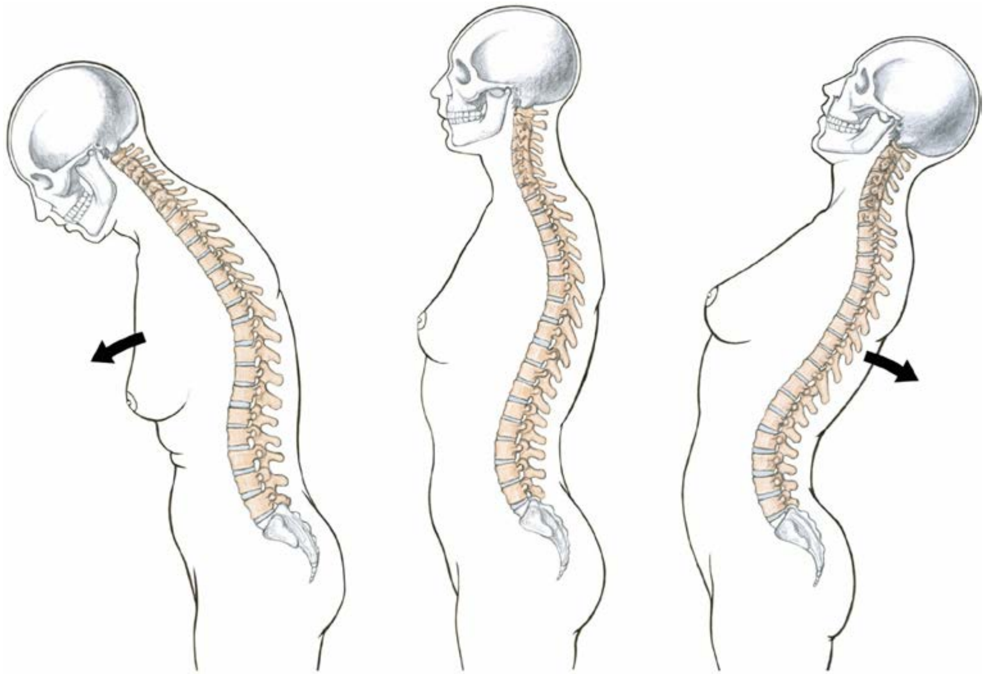
Movements of the Vertebral Column with the Rib Cage

Because the ribs connect into the thoracic vertebrae, restricting movement, the thoracic joints are not as flexible as the cervical or lumbar joints. Whenever there is movement of the vertebral column, the rib cage generally moves as a single unit, in a forward or backward direction (flexion and extension), bending sideways (lateral flexion), or twisting or swiveling (rotation).

In the drawing *Flexion and Extension of Rib Cage at the Vertebral Joints,* we see how the rib cage moves in a forward and back direction. Flexion is the movement of bending the torso (rib cage and vertebral column) forward from a stationary pelvis. Extension is returning the torso to its normal position or bending the torso back, which is sometimes called hyperextension.

FLEXION AND EXTENSION OF RIB CAGE AT THE VERTEBRAL JOINTS

Gliding joint action



LEFT: Flexion of torso and vertebral column

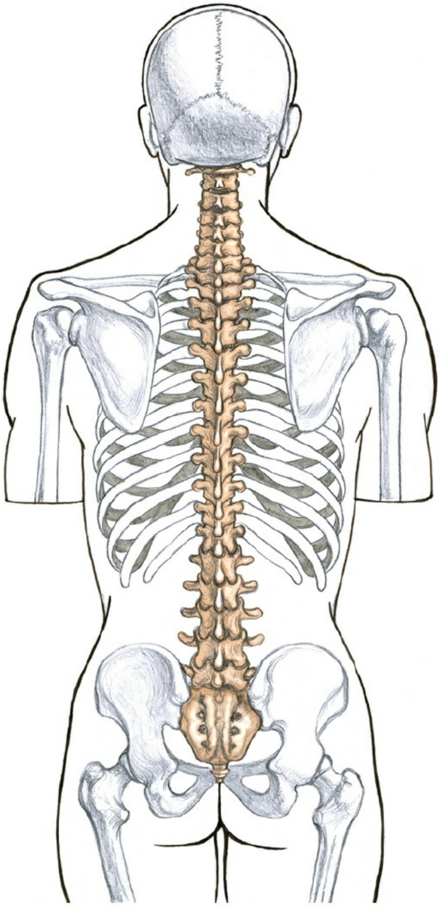
CENTER: Neutral position of vertebral column, lateral view

RIGHT: Extension of torso and vertebral column

In the following drawing, *Lateral Flexion of the Rib Cage at the Vertebral Joints,* we see the torso bending in a side direction, called lateral flexion, from a stationary pelvis. The torso can, of course, bend toward either the right or left.

LATERAL FLEXION OF THE RIB CAGE AT THE VERTEBRAL JOINTS

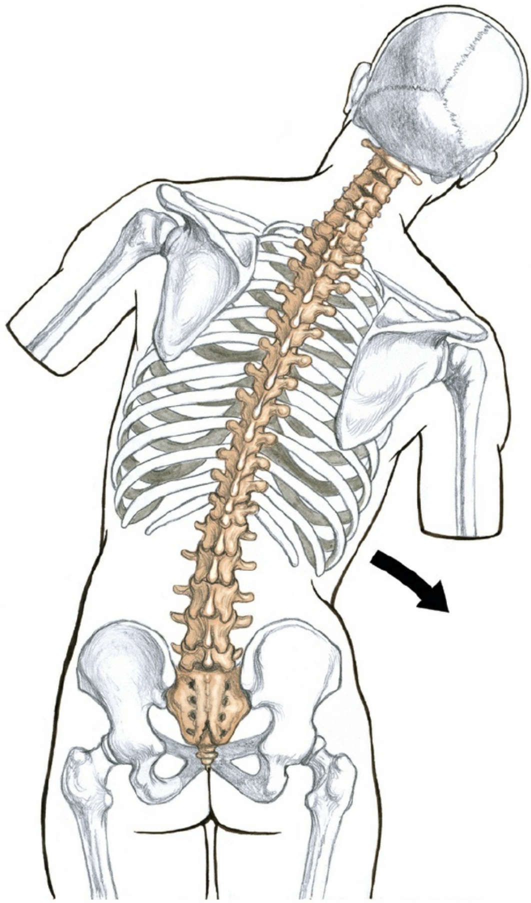
Gliding joint action



Posterior view

The vertebral column is in neutral position.

Gliding joint action



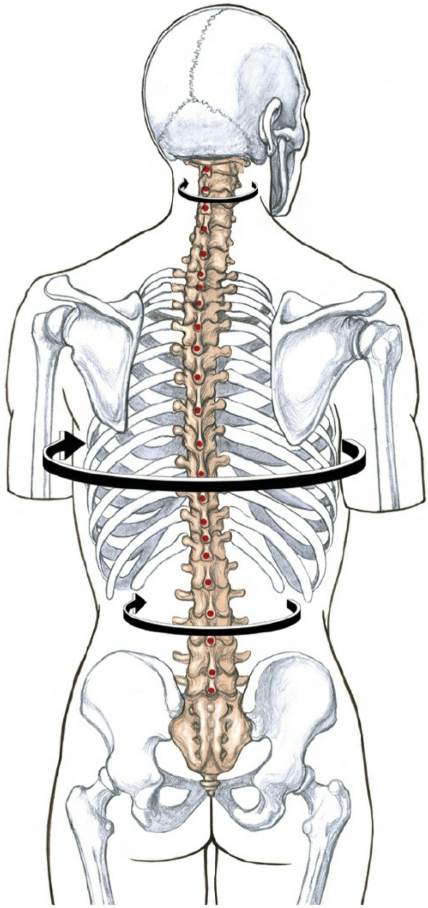
Posterior view

The figure leans toward the right from a stationary pelvis. (Movement can also be of the figure leaning toward the left.)

The drawing *Rotation of the Rib Cage at the Vertebral Joints,* shows how the rib cage can turn on the axis of the vertebral column, rotating the torso (cranium, rib cage, and vertebral column) toward either the right or left (right rotation, left rotation) from a stationary pelvis.

ROTATION OF THE RIB CAGE AT THE VERTEBRAL JOINTS

Pivotal and gliding joint action



Posterior view

The torso, head, and neck are shown rotating toward the right. The torso, neck, and head can also rotate toward the left. *Vertebral column in neutral position shown here.*

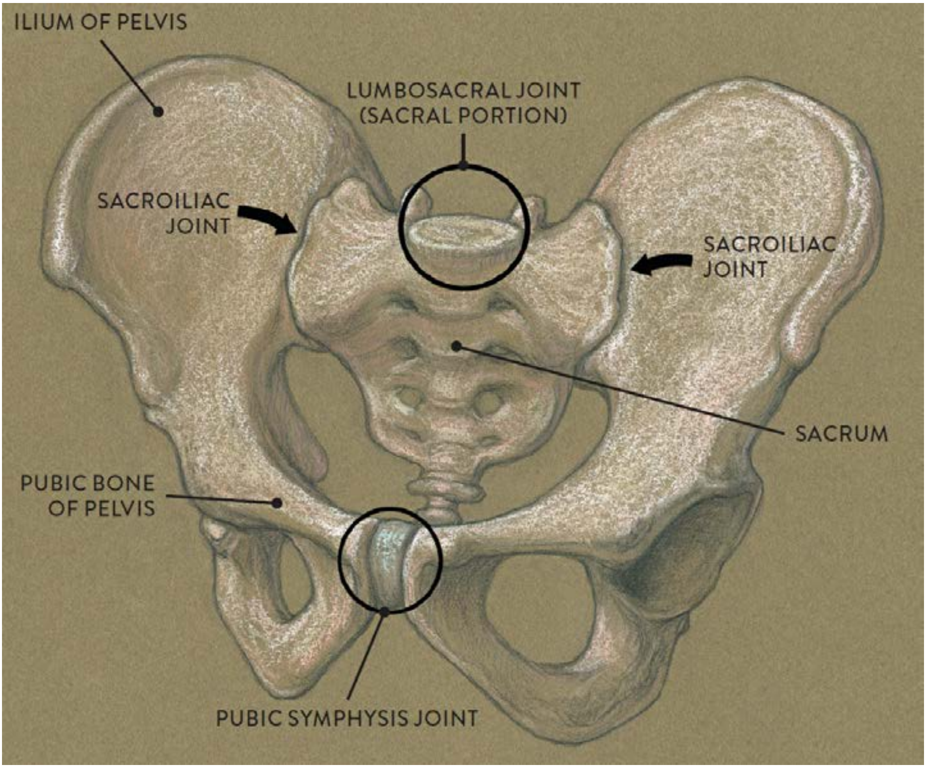
RED DOTS
Positions of the spinous processes of the vertebral column
BLACK ARROWS
Pivotal movements of the head, neck, and rib cage from the vertebral column

The Joints of the Pelvis

As we move down the vertebral column beyond the rib cage, we encounter the lumbar vertebrae. These large forms help support the weight of the head, neck, and rib cage. The lumbar joints help move the rib cage when the pelvis is more or less stationary, but they also assist in moving the pelvis to various positions.

The joint between the last lumbar vertebra (L5) and the sacrum is called the *lumbosacral joint* (pron., LUM-bo-SAY-krul). This gliding/plane joint, along with the assistance of the other lumbar joints and the hip joint, allows the pelvis to move in slightly different directions as a whole unit.

Anterior three-quarter view of pelvis



The pelvis contains two other types of joints—the two *sacroiliac joints* (pron., SAY-kro-IL-ee-ak; located between the sacrum and ilium) and the *pubic symphysis joint* (pron., PYOO-bic SIM-fih-sis; located between the two pubic bones). The sacroiliac and pubic symphysis joints are capable of small, limited gliding motions (interpelvic motions), too subtle to detect on the surface. Artists should think of the pelvis as a single structure that moves as a unit and not as individual bones shifting up or down.

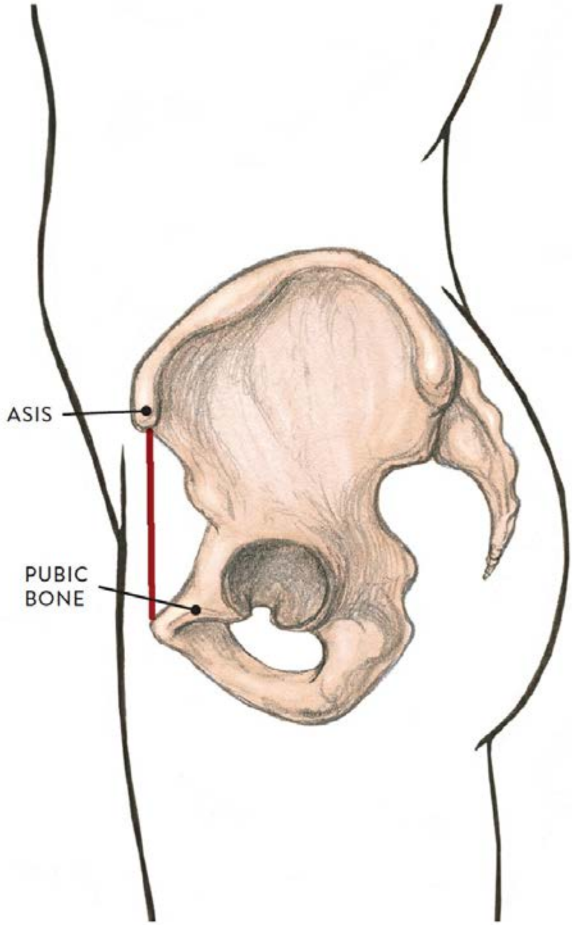
Movements of the whole pelvis as a single unit include anterior and posterior pelvis tilts (tilting forward and backward), lateral flexion (bending of the pelvis to the side), and rotation of the whole pelvis toward either the right or left. The lumbar joints and hip joint (femoroacetabular joint) participate in these movements.

The drawing *Anterior and Posterior Pelvic Tilts,* shows the pelvis tilting in forward and backward directions. *Anterior pelvic tilt* (APT) is the tilting of the upper part of the pelvis in a forward and downward direction. The buttocks are lifted upward during this

movement, and the vertebral column is usually arched. *Posterior pelvic tilt* (PPT) is the tilting of the upper part of the pelvis backward. The buttocks are tucked in during this movement.

ANTERIOR AND POSTERIOR PELVIC TILTS

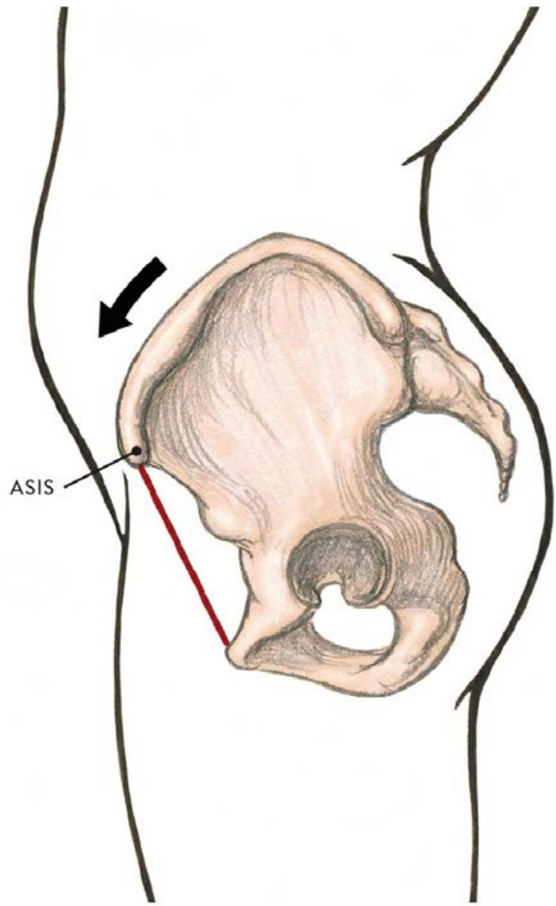
Gliding joint action



Neutral position of pelvis, lateral view

From a lateral view, the ASIS appears to be positioned somewhat vertically over the pubic bone.

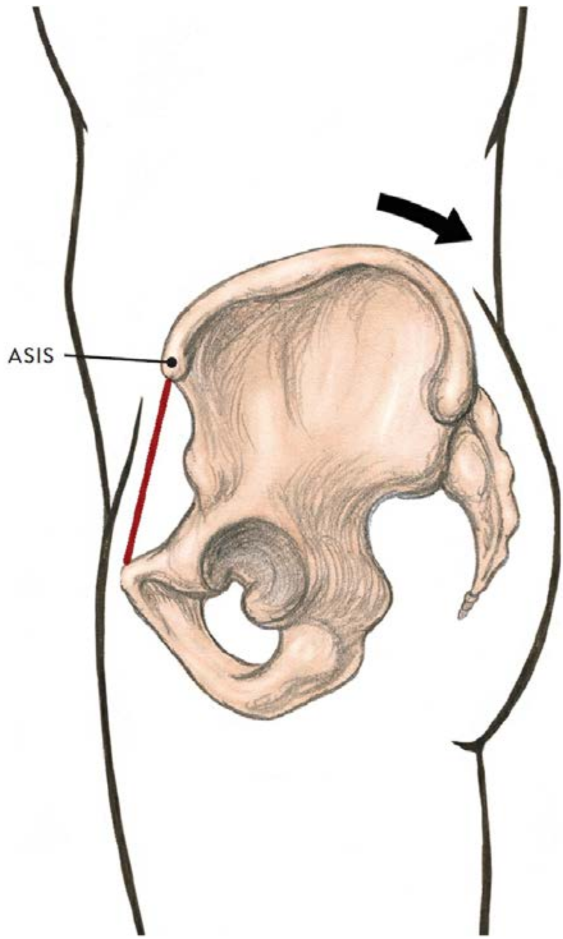
Gliding joint action



Anterior pelvic tilt (APT), lateral view

The upper part of the pelvis tilts in a forward and downward direction. Each ASIS is in a lower position than when the pelvis is in neutral position.

Gliding joint action



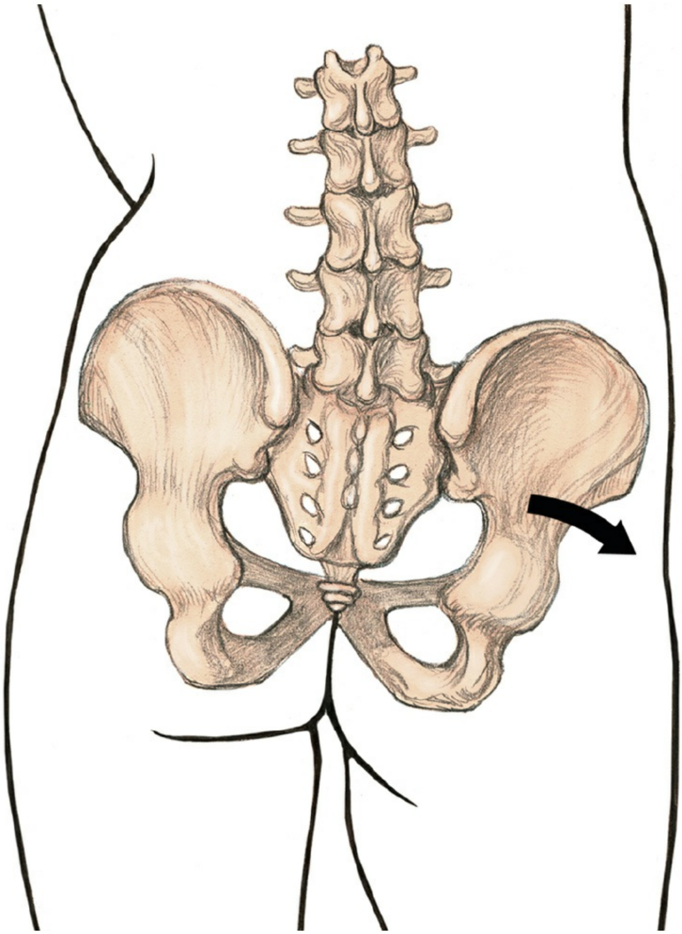
Posterior pelvic tilt (PPT), lateral view

The upper part of the pelvis tilts back. Eash ASIS is in a higher position than when the pelvis is in neutral position.

In the drawing *Lateral Flexion of Pelvis at the Lumbosacral Joint,* we see the pelvis tilting sideways. Lateral flexion is tilting the whole pelvis sideways, either toward the right (right lateral flexion) or left (left lateral flexion).

LATERAL FLEXION OF PELVIS AT THE LUMBOSACRAL JOINT

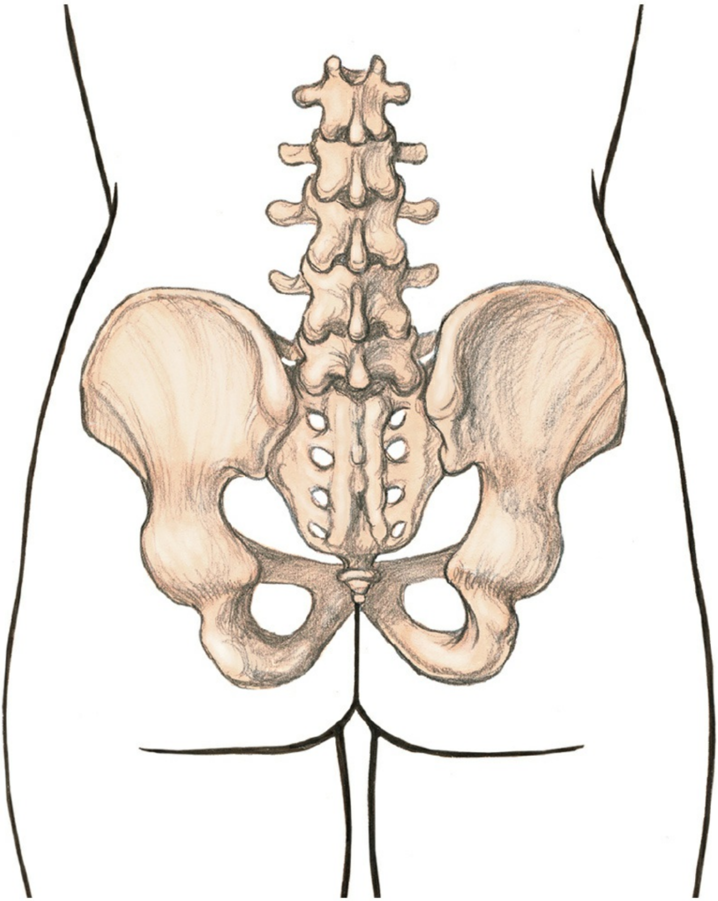
Gliding joint action



Right lateral flexion, posterior view

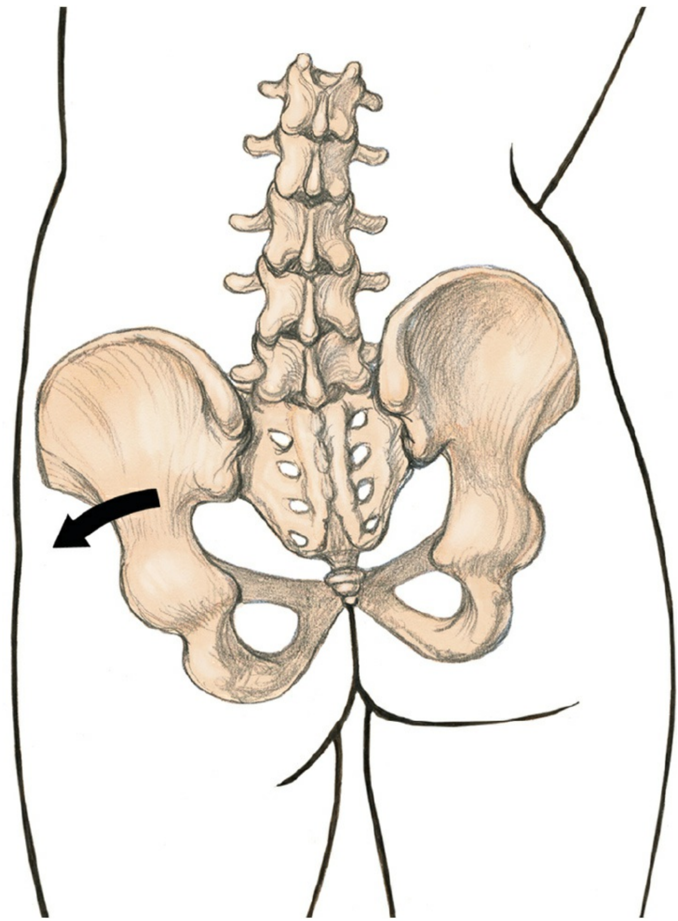
Pelvis tilts toward the right side.

Gliding joint action



Neutral position of pelvis, posterior view

Gliding joint action



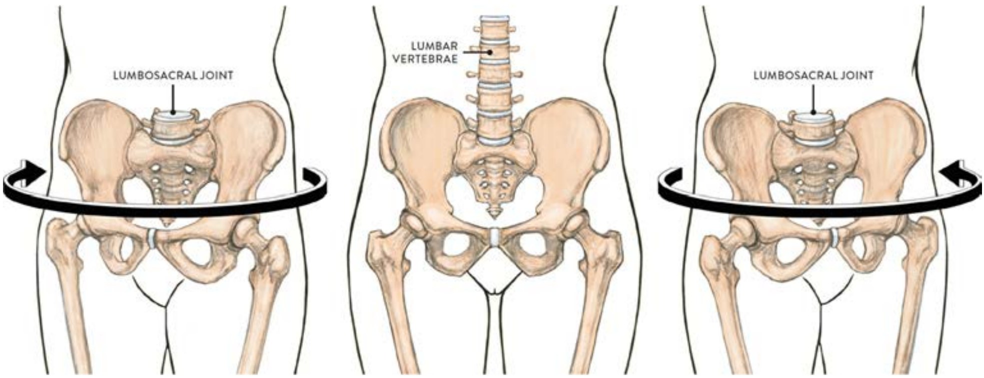
Left lateral flexion, posterior view

Pelvis tilts toward the left side.

The drawing *Rotation of Pelvis at the Lumbosacral Joint and Lumbar Vertebrae Joints,* shows the action of swiveling the hips as the pelvis rotates toward the right and left.

ROTATION OF PELVIS AT THE LUMBOSACRAL JOINT AND LUMBAR VERTEBRAE JOINTS

Pivotal and gliding joint action



LEFT: Rotation of pelvis toward the right, anterior view

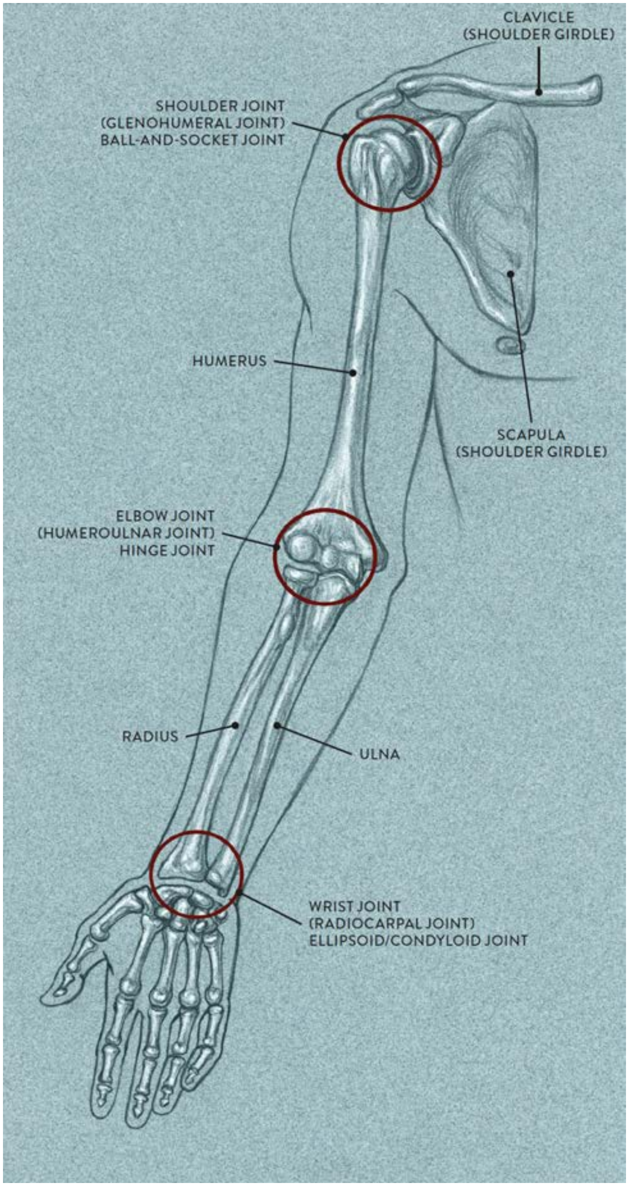
CENTER: Neutral position of pelvis, anterior view

RIGHT: Rotation of pelvis toward left, anterior view

Joints of the Upper Limb and Shoulder Girdle

The main joints of the upper limb are the shoulder joint, elbow joint, wrist joint, and joints of the hand (including finger joints and thumb joints). The drawing shows their locations, identifying the type of each joint.

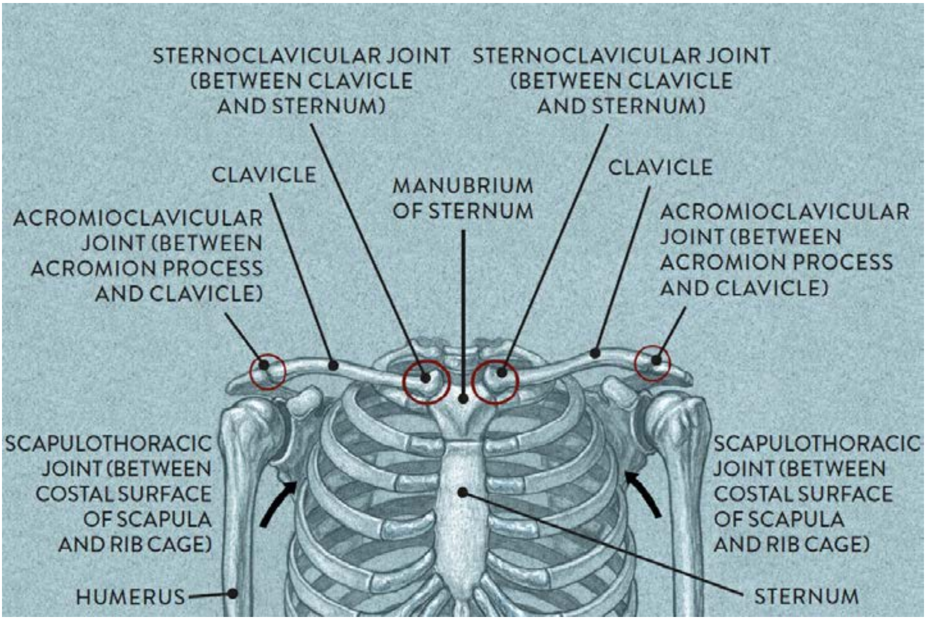
MAIN JOINTS OF THE UPPER LIMB



Anterior view of right arm in anatomical position

The *shoulder girdle,* or *pectoral girdle,* comprises the clavicles (collarbones) and the scapula bones (shoulder blades) and is the supportive framework to which the upper

limbs connect. The shoulder girdle has three main joints: the *scapulothoracic joint, sternoclavicular joint,* and *acromioclavicular joint*. These joints and the associated bones are shown in the following drawing.



Rib cage and shoulder girdle, anterior view

The *scapulothoracic joint* (pron., SKAP-pah-low-thoh-RAS-ik) is the articulation between the scapula bone and the posterior portion of the thorax (rib cage). Anatomically, this is not a true joint, but it is considered a functional joint because of the way the scapula moves in relation to the rib cage.

Names of Shoulder-Girdle Joints

The names of shoulder-girdle joints provide clues to their location:

- *Scapulo* pertains to the scapula bone.
- *Thoracic* pertains to the thorax, or rib cage.
- *Sterno* pertains to the sternum.
- *Clavicular* pertains to the clavicle.
- *Acromio* pertains to the acromion process of the spine of the scapula.

Movements of the Scapula

It is very beneficial for artists to learn about the scapula bones and how they move. Several muscles attach into these bones, and when the various muscles contract, they move the scapula to slightly different positions on the back. This can noticeably change the topography of the back, with the bulges and valleys of the muscular forms changing from pose to pose. The best way to understand what is occurring on the back is to look for three basic skeletal structures: the rib cage, the vertebral column, and the position of the scapula bones. The presence of the scapula can most easily be detected at the scapula's medial/vertebral border. You can quickly assess where the scapula bones are by observing the action of the arms, then looking for the medial border, which will enable you to see the approximate location of the scapula bones in that particular pose. From there you can locate the general muscular forms.

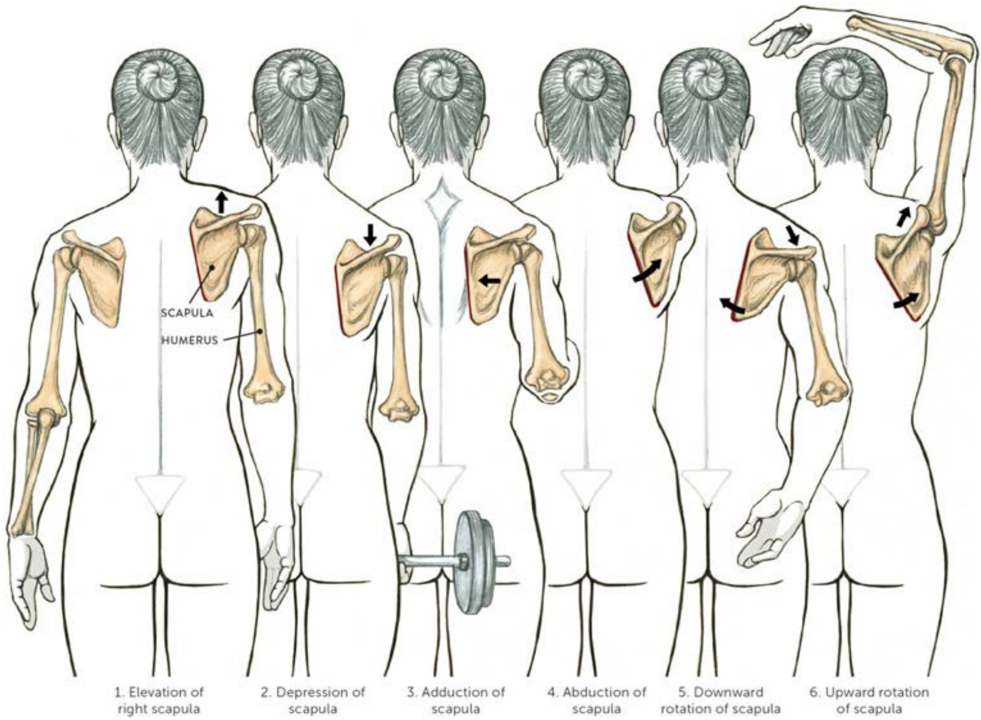
In the next drawing, *Movements of the Scapula at the Scapulothoracic Joint,* we see the many possible positions of the scapula. Since the humerus connects into the scapula, these two bones work as a team in movements of the upper arm. When the humerus moves to different positions, the scapula bone will also move, unless it is intentionally stabilized by certain muscles. The movements of the scapula, shown in the drawing include the following:

- *Elevation of the scapula*: The shoulders lift upward, as in the action of shrugging the shoulders.
- *Depression of scapula*: The scapula returns to its normal position or slightly lower, which occurs when lifting a heavy weight, such as a barbell.
- *Adduction (or protraction) of the scapula*: As the upper arm moves back, the scapula moves back toward the vertebral column. This action can be seen in the military stance of attention or when someone is "jabbing" his or her elbows.
- *Abduction (or retraction) of the scapula*: As the arm reaches forward, the scapula moves away from the vertebral column. This action can be seen when a person crosses both arms in front of the torso or is hunched over. It can also be seen when someone dynamically thrusts the arms forward when reaching for something.
- *Downward rotation of the scapula*: The scapula tilts, with the bottom tip (*inferior angle*) moving slightly inward while the acromion process moves downward. The bottom tip of the scapula can also lift slightly away from the rib cage, creating tension in this region. This action can be seen when someone reaches into a back trouser pocket.
- *Upward rotation of the scapula*: The scapula tilts, with the bottom tip moving

slightly outward and the acromion process tilting upward. This action can be seen when the whole arm is lifted upward.

MOVEMENTS OF THE SCAPULA AT THE SCAPULOTHORACIC JOINT

Posterior view of the torso



Left scapula and bones of arms are in normal position

ARROWS: Directional movements of the scapula
RED LINES: Medial/vertebral border of the scapula

The Joints of the Clavicle

Each clavicle (collarbone) attaches to two different bones—the sternum and the acromion process of the scapula (the outer end of the spine of the scapula)—thus creating two separate clavicular joints: the sternoclavicular joint and the acromioclavicular joint. The clavicle, scapula, and humerus (which attaches into the scapula) are all interconnected, so if one bone moves, the other bones usually move as well.

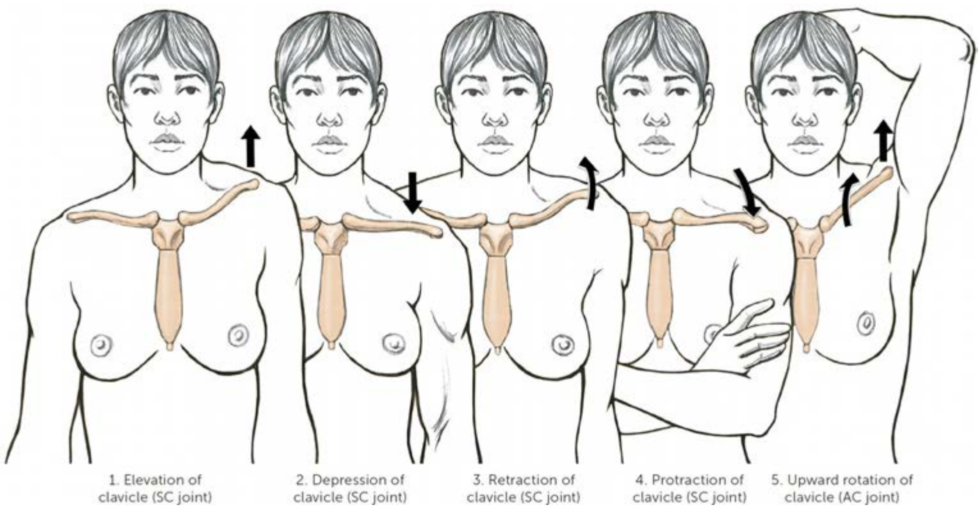
The *sternoclavicular joint* (pron., STER-no-cla-VICK-yoo-lar), or SC joint, is the joint between the inner end of the clavicle and the upper portion (manubrium) of the sternum (breastbone). It is usually classified as a gliding/plane joint, but some experts consider it a saddle joint. Movements at the SC joint are elevation and depression of the clavicle and protraction and retraction of the clavicle.

The *acromioclavicular joint* (pron., ah-CROW-mee-oh-cla-VICK-yoo-lar), or AC joint, is the joint between the outer end of the clavicle and the acromion process of the scapula. It, too, is a gliding/plane joint. Movements at the AC joint are upward and downward rotation of the clavicles and scapula.

To keep things simple, only the clavicles and the sternum are shown in each of the movements depicted in the drawing *Movements of Clavicle at the Sternoclavicular (SC) and Acromioclavicular (AC) Joints,* below. Remember, however, that when the clavicle moves, the scapula and humerus move, as well. (Note that downward rotation of the clavicle is not shown in the drawing.)

MOVEMENTS OF CLAVICLE AT THE STERNOCLAVICULAR (SC) AND ACROMIOCLAVICULAR (AC) JOINTS

Gliding joint actions, anterior view of the torso



ARROWS: Directional movements of the clavicle

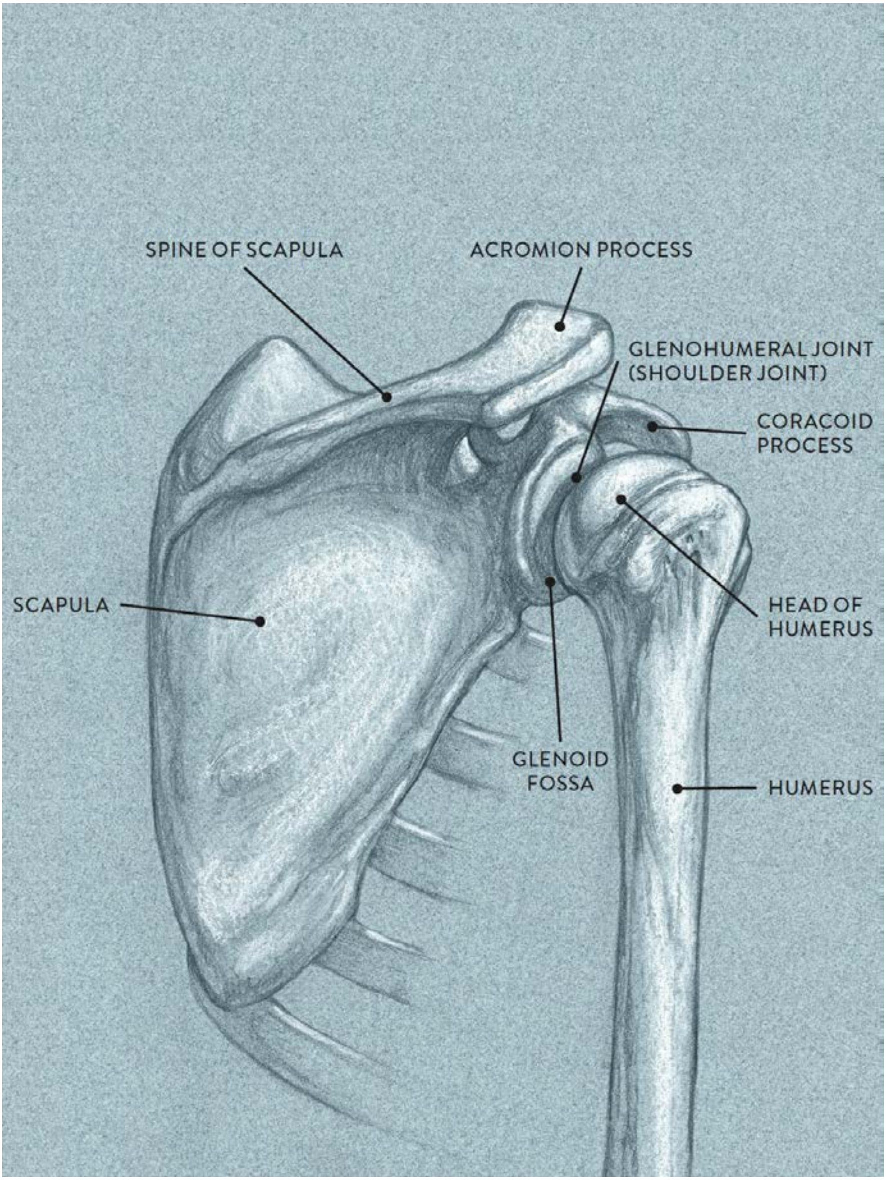
The movements of the clavicle include the following:

- *Elevation of the clavicle* (at the SC joint): The shoulders are shrugged or one shoulder is lifted higher than the other.
- *Depression of the clavicle* (at the SC joint): The shoulder returns to its normal position from an elevated position, or the outer end of the clavicle drops even lower, as when a person is holding a heavy weight, such as a barbell.
- *Retraction of the clavicle* (at the SC joint): The shoulders are thrown back, as in the military stance of attention.
- *Protraction of the clavicle* (at the SC joint): The shoulders roll forward, as when hunching over or folding the arms in front of the torso.
- *Upward rotation of the clavicle* (at the AC joint): The upper arm (humerus) is lifted up over the head as in the action of abduction, producing an upward rotation of the scapula that results in the outer end of the clavicle lifting upward and slightly rotating (posterior rotation).

(Note that the clavicle appears to be performing the same upward-tilting action in both the elevation of the clavicle and the upward rotation of the clavicle. The difference is that when the clavicle elevates—as when shrugging the shoulders—the scapula *also* elevates, with both bones moving in an upward direction, although the inner end of the clavicle at the SC joint remains fixed. In the movement of upward rotation of the clavicle, however, the scapula tilts while the clavicle elevates and rotates.)

The Shoulder Joint

The *shoulder joint,* known anatomically as the *glenohumeral joint* (pron., GLEN-o-HYOO-mer-al or GLEE-no-HYOOM-er-al) is the articulation between the head of the humerus (upper arm) and a small, shallow socket on the scapula called the *glenoid fossa.* This joint, shown in the drawing below, cannot be seen on the surface because it is covered by layers of cartilage, ligaments, and muscles. A ball-and-socket joint, it produces a wide range of movements of the humerus bone, including flexion and extension, abduction and adduction, medial and lateral rotation, and circumduction of the humerus.



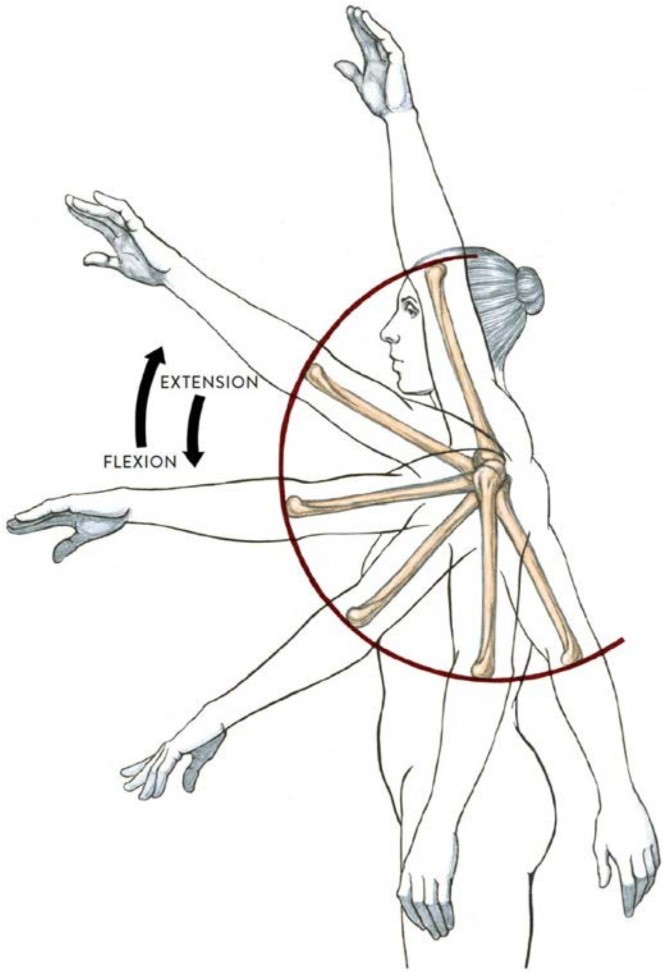
Posterior lateral view of right scapula and humerus bone

The drawing *Flexion and Extension of Humerus at Shoulder Joint,* shows the humerus performing a forward-and-back movement. Flexion is the action of moving the

humerus in a forward direction and can continue until the whole arm is above the head. Extension is the reverse of this action, in which the humerus is returned to its neutral position at the side of the torso. A continuing movement of the humerus toward the back is sometimes referred as hyperextension of the humerus.

FLEXION AND EXTENSION OF HUMERUS AT SHOULDER JOINT

Ball-and-socket joint action



Lateral view of torso and left arm

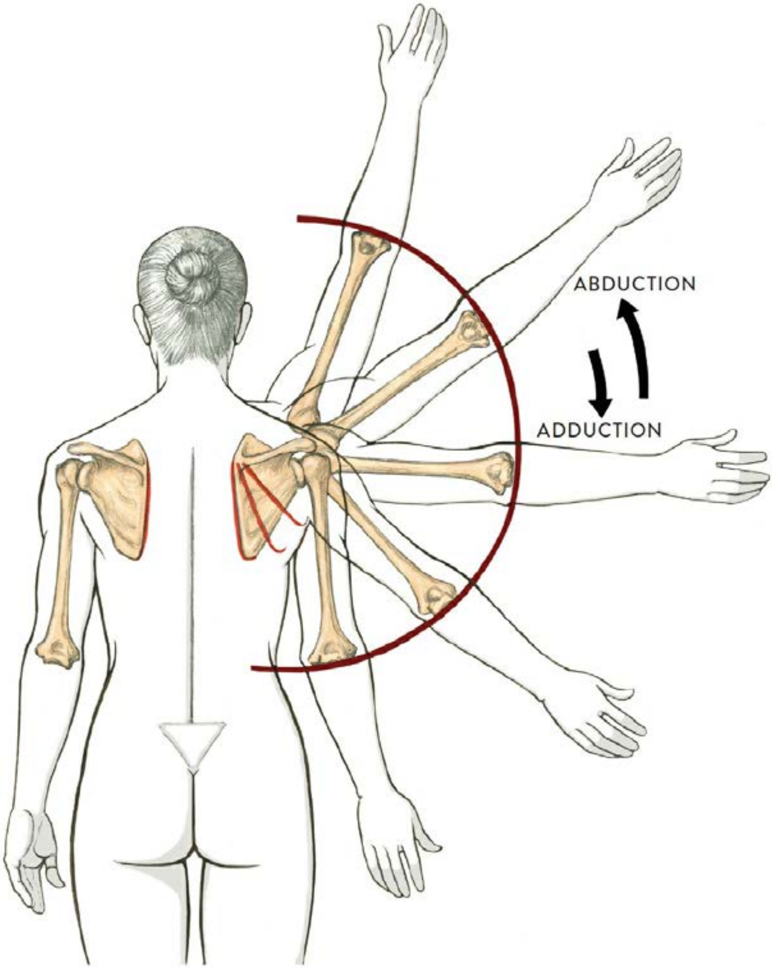
MAROON HALF-CIRCLE: Arclike directional movement of the humerus bone as it swings upward or downward

In the drawing *Abduction and Adduction of Humerus at Shoulder Joint,*, we see the humerus moving sideways away from the torso. Abduction is the action of moving the

humerus away from the side of the body and can continue upward until the whole arm is above the head. Adduction is the return of the humerus back to the side of the torso. Adduction of the humerus can continue farther, as when the upper arm is moved across the chest.

ABDUCTION AND ADDUCTION OF HUMERUS AT SHOULDER JOINT

Ball-and-socket joint action



Posterior view

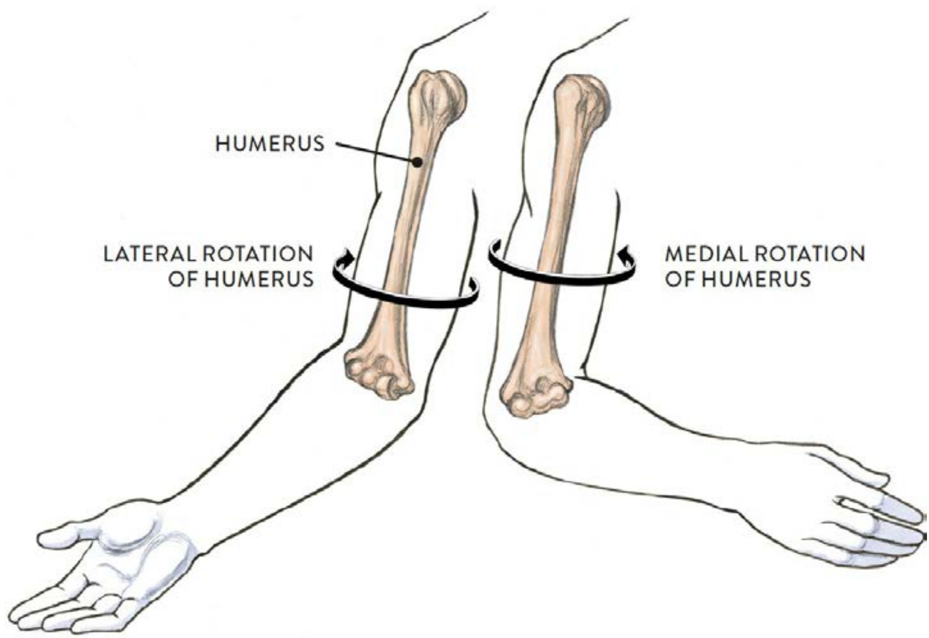
RED LINES: Medial border of the scapula, showing how it changes position as the humerus moves MAROON HALF-CIRCLE: Arclike directional movement of humerus bone as it swings upward or downward

Next, in the drawing *Lateral and Medial Rotation of Humerus at Shoulder Joint,* we

see the humerus pivoting on its own axis. When the humerus rotates in an outward direction, the action is called lateral rotation because the bone is turning away from the midline of the body. When the humerus rotates in an inward direction, this action is called medial rotation because it is turning toward the midline of the body.

LATERAL AND MEDIAL ROTATION OF HUMERUS AT SHOULDER JOINT

Ball-and-socket joint action

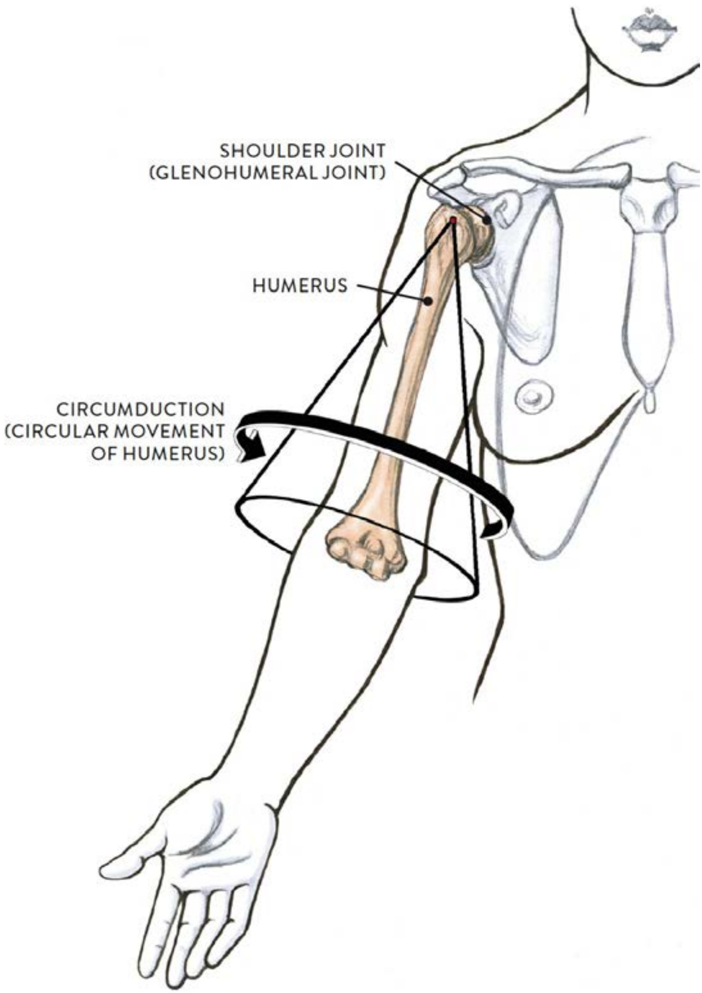


Anterior view of the right upper limb

Finally, in the drawing *Circumduction of Humerus at Shoulder Joint,* we see the circular movement of the humerus. This movement is often confused with the rotation of the humerus, but the difference is that, in circumduction, the whole humerus (or upper arm) is moving in a circular motion while the head of the humerus at the shoulder joint remains somewhat stabilized. The movement is essentially "drawing a circle" with the hand (with both the upper and lower arm involved) or with the elbow (with the circular movement restricted to the upper arm). Circumduction circles can be broad or narrow and can be executed in a clockwise or counterclockwise direction.

CIRCUMDUCTION OF HUMERUS AT SHOULDER JOINT

Ball-and-socket joint action

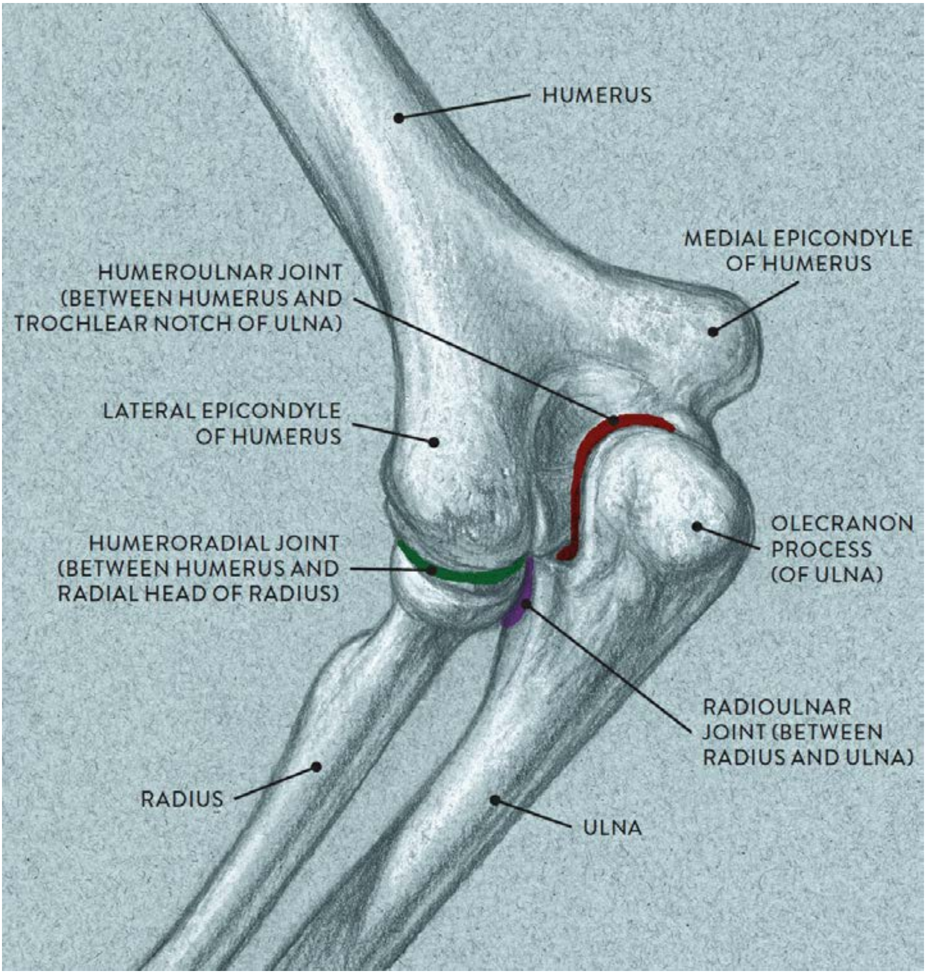


Anterior view of right arm and partial torso

The Elbow Joint

The elbow joint actually consists of three joints: the humeroulnar joint, the humeroradial joint, and the proximal radioulnar joint. Although the functions of these three joints are separate, they share the same joint capsule and are grouped together anatomically as a

single joint complex.



Posterior three-quarter view of left arm

Names of Elbow-Complex Joints

The names of elbow-complex joints provide clues to their location:

- *Humero* pertains to the humerus bone.
- *Radial* or *radio* pertains to the radius bone.

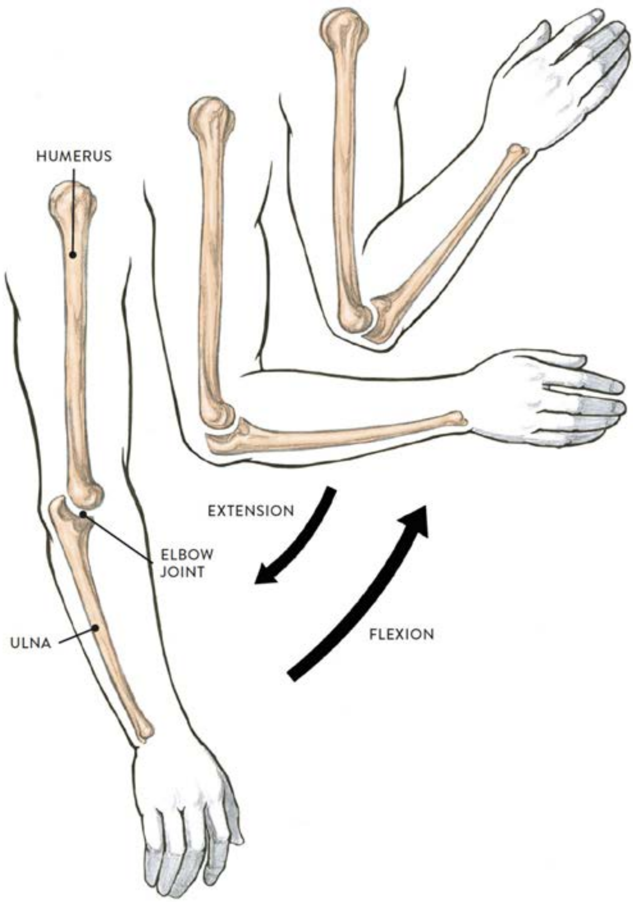
- *Ulnar* pertains to the ulna bone.
- *Proximal* refers to the area closest to the body part's point of attachment.
- *Distal* refers to the area farthest from the body part's point of attachment.

The *humeroulnar joint* (pron., HYOO-mer-o-ULL-nar) occurs between the humerus of the upper arm and the ulna of the lower arm. At the base of the humerus is a smooth surface called the *trochlea of the humerus,* shaped somewhat like a horizontally positioned sewing spool. At the upper part of the ulna, a bony surface called the *trochlear notch of the ulna* is shaped like a crescent wrench. The crescent-wrench shape of the ulna fits around the spool-like shape of the humerus.

In the drawing *Flexion and Extension of Lower Arm at Elbow Joint,* we see that the articulation between the humerus and ulna is a hinge joint that produces a back and forth movement of the ulna bone. Flexion is when the lower arm moves toward the upper arm; extension is the straightening of the lower arm.

FLEXION AND EXTENSION OF LOWER ARM AT ELBOW JOINT

Hinge joint action



Lateral view of upper and lower right arm (radius bone of lower arm not shown)

The *humeroradial joint* (pron., HYOO-mer-oh-RAY-dee-ul) is located between the lower portion of the humerus and the upper portion of the radius bone. At the base of the humerus, positioned next to the *trochlea of the humerus,* is a spherical form called the *capitulum of the humerus.* At the upper part of the radius is a small wheel-shaped structure called the *head of the radius* (or *radial head*). The top surface of the radial head is slightly concave, and this is where it articulates with the round capitulum. The humeroradial joint is classified as a pivot joint and passively participates in the rotational movements of supination and pronation of the lower arm. This joint does not

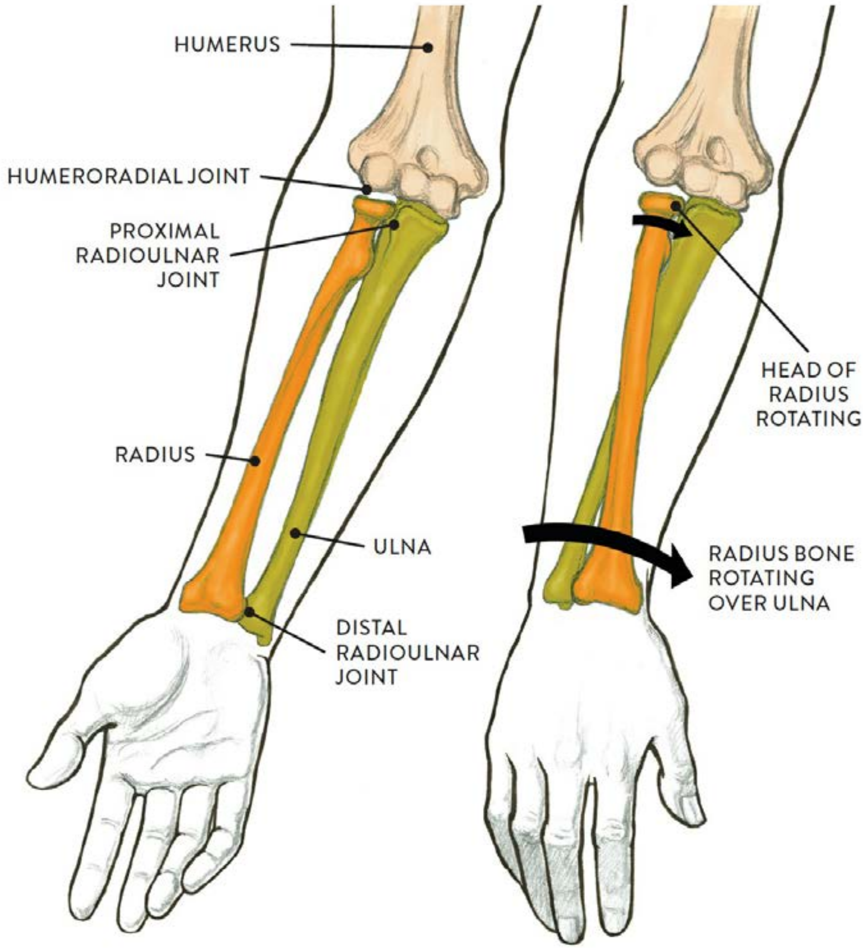
participate in the hinge movement of the elbow.

The *proximal radioulnar joint* (pron., PROCKS-sih-mal RAY-dee-oh-ULL-nar) occurs between the head of the radius and a small indentation on the ulna called the *radial notch.* A small ligament band (annular ligament) attaches from the ulna and encircles the neck and head of the radius bone, acting like a supportive strap keeping the head of the radius in place as it swivels or rotates. The proximal radioulnar joint is anatomically considered part of the elbow joint since it shares the same joint capsule, but the function of this joint is distinct from that of the elbow joint.

The drawing *Supination and Pronation of Lower Arm and Hand at Elbow Joint Region,* shows rotational movements occurring at the elbow joint and wrist. The humeroradial and proximal radioulnar joints are both pivot joints, and both participate in the actions of supination and pronation. When the lower arm is in the anatomical position, the two bones (radius and ulna) are parallel. Pronation is the rotational movement of the lower arm in which the radius bone pivots or swivels over the relatively stationary ulna bone. When it does this, the hand flips from facing upward or toward the front to facing downward or toward the back. Supination is the reverse of this action, moving the radius back to a position parallel to the ulna. The pivot movement actually takes place on both ends of the radius and ulna bones—at the proximal radioulnar joint, located in the upper region of the radius and ulna bones (and assisted by the humeroradial joint), as well as at the distal radioulnar joint, which is located at the lower region of the radius and ulna bones. (The distal radioulnar joint shares the joint capsule of the wrist joint and is considered by some experts to be part of the wrist joint.)

SUPINATION AND PRONATION OF LOWER ARM AND HAND AT ELBOW JOINT REGION

Pivot joint action



LEFT: Supination

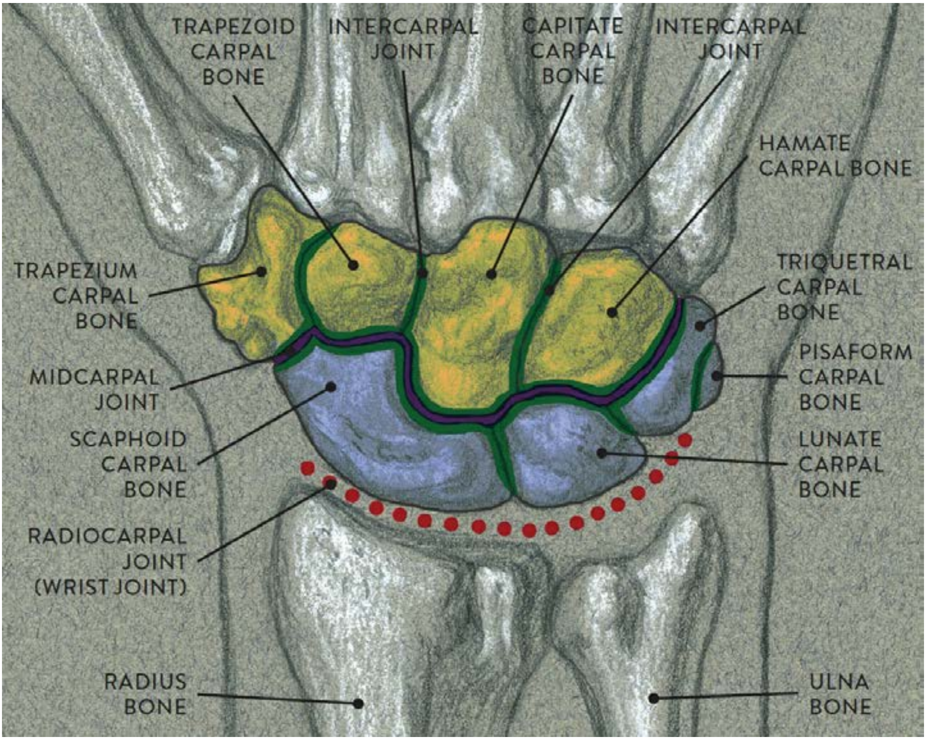
Palm faces toward the front (right arm in anatomical position).

RIGHT: Pronation

Palm faces toward the back (right arm in anatomical position, pronating).

The Joints of the Wrist Region

At the wrist region are three main joints or groups of joints: the intercarpal joints, the midcarpal joint, and the radiocarpal joint. Of the three, only the radiocarpal joint is (somewhat) detectable on the surface, because it is the transitional region between the lower arm and the hand. It is the main joint involved in the movements of bending the hand at the wrist in different directions.



Wrist region of right hand, dorsal surface

GREEN LINES: Intercarpal joints (joints between all the carpal bones)
DARK PURPLE LINE: Midcarpal joint (joint between the proximal and distal rows of carpal bones)
DOTTED RED LINE: Radiocarpal joint (between the radius bone and the scaphoid, lunate, and triquetral carpal bones)
LIGHT PURPLE AREA: Proximal row of carpal bones
YELLOW AREA: Distal row of carpal bones

The *intercarpal joints,* also known as *carpal joints,* are the joints between the eight carpal bones. The *midcarpal joint* is the joint between the proximal and distal rows of carpal bones. Gliding and slight rotational movements occur between the carpal bones during the movements of flexion, extension, abduction, and adduction of the hand at the wrist joint.

The *radiocarpal joint* (pron., RAY-dee-o-KAR-poll), also known as the wrist joint, is between the lower end of the radius bone of the lower arm and three of the carpal

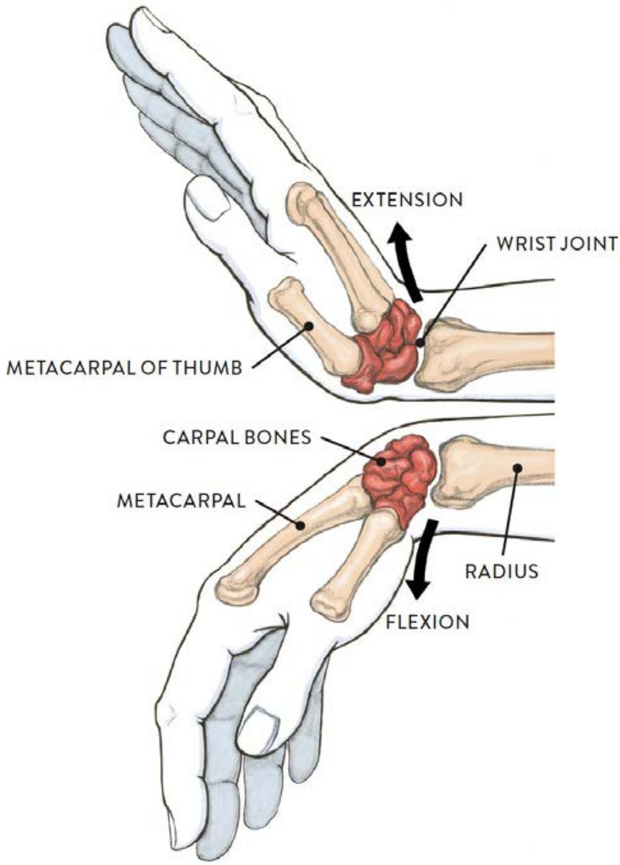
bones (scaphoid, lunate, and triquetral) of the wrist. These three carpal bones are positioned side by side in a convex alignment that articulates with the concave surface of the end of the radius bone. Because of the overall shape of the articulating surfaces, the radiocarpal joint is classified as an ellipsoid/condyloid joint and is capable of moving the hand at the wrist in many ways, including flexion and extension, abduction adduction, and circumduction (the circular movement of the hand at the wrist).

Movements of the wrist joint include flexion and extension (moving the hand up and down from the wrist) and radial abduction and ulnar adduction (side-to-side movements of hand at the wrist). (The wrist can also perform a circular action called circumduction, but this is not shown in the drawings.)

In the drawing *Flexion and Extension of Hand at the Wrist Joint,* below, we see the downward and upward movement of the hand from the wrist. Flexion is the action of bending the palm side of the hand toward the anterior region of the lower arm, no matter what position the lower arm is in. Extension is the reverse of this action, returning the hand to its neutral position. Extension can go farther, bending the dorsal part of the hand toward the posterior side of the lower arm, no matter what position the lower arm is in. This action of bending the back of the hand from the wrist is also known as hyperextension.

FLEXION AND EXTENSION OF HAND AT THE WRIST JOINT

Ellipsoid/condyloid joint actions

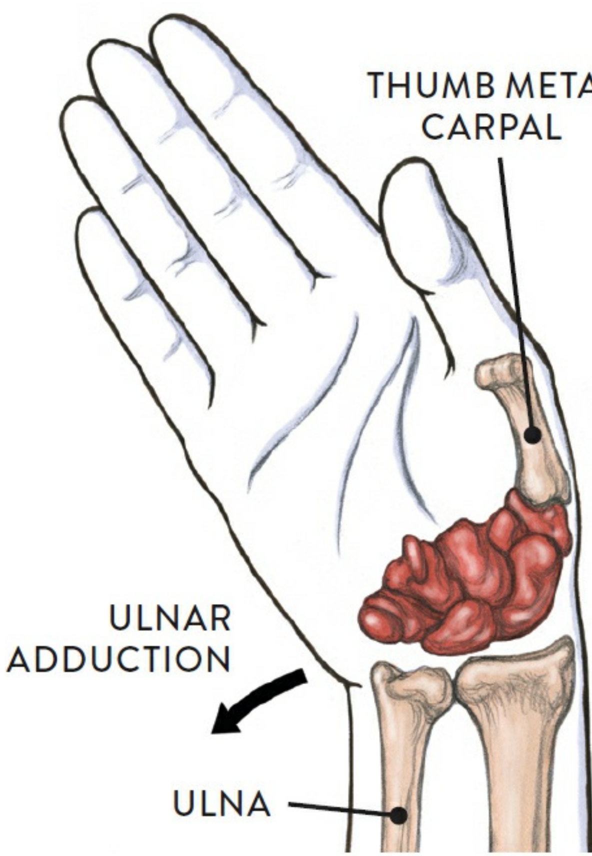


Lateral view of right hand

In the drawing *Ulnar Adduction and Radial Abduction of Hand at the Wrist Joint,* we see the movement of tilting the hand sideways from the wrist. Ulnar adduction (also called ulnar deviation) is the sideways tilting of the hand on the side of the lower arm containing the ulna bone. Radial abduction (radial deviation) is the sideways tilting of the hand on the side of the lower arm containing the radius bone; this movement is limited by the radial styloid process (a small projection of bone on the radius), which comes into close contact with the scaphoid carpal bone.

ULNAR ADDUCTION AND RADIAL ABDUCTION OF HAND AT THE WRIST JOINT

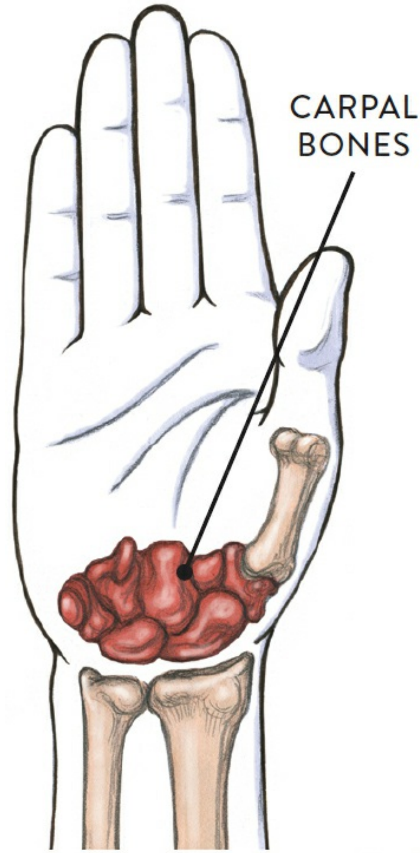
Ellipsoid/condyloid joint actions, palmar view of the right hand



Ulnar adduction (ulnar deviation)

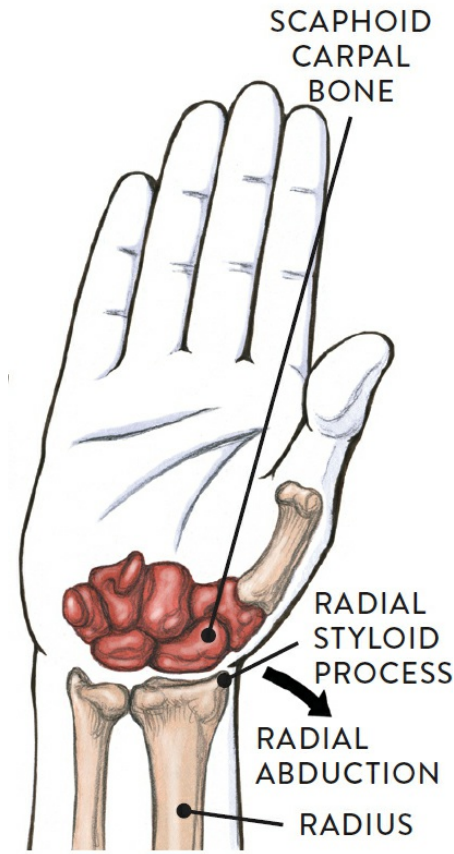
Hand tilts sideways over ulna.

Ellipsoid/condyloid joint actions, palmar view of the right hand



Neutral position of hand

Ellipsoid/condyloid joint actions, palmar view of the right hand

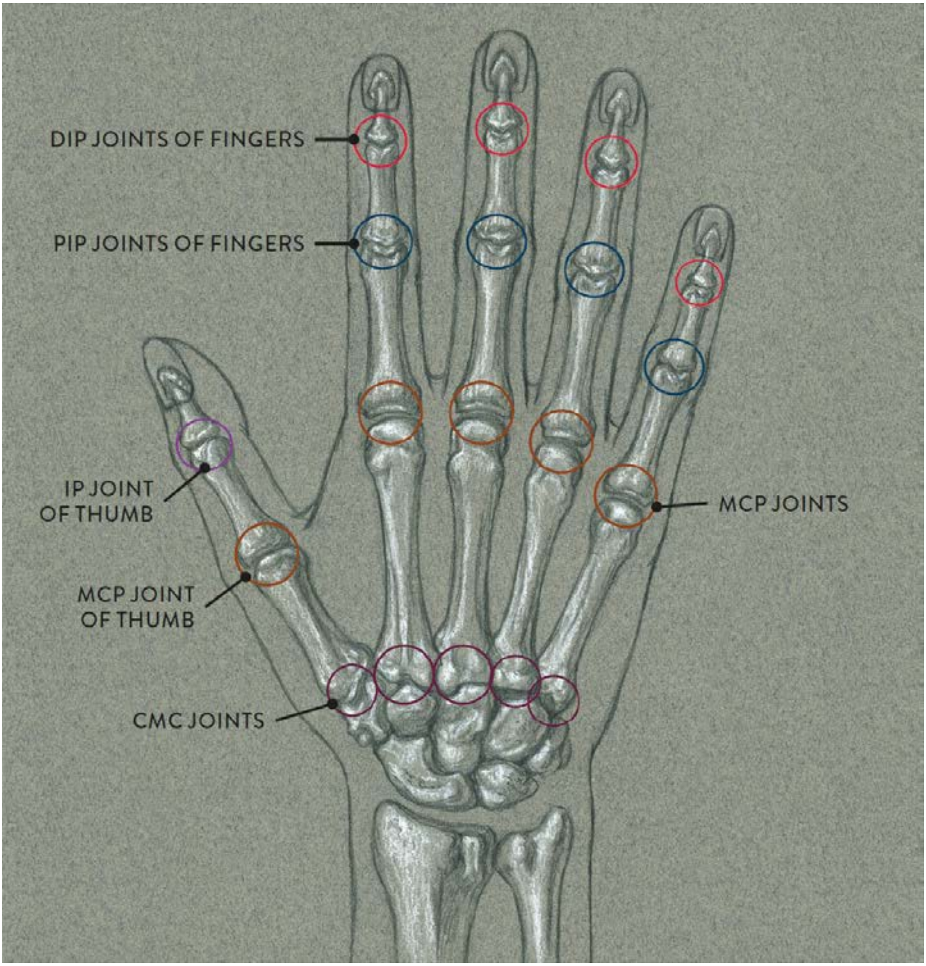


Radial abduction (radial deviation)

Hand tilts sideways over radius.

The Joints of the Hand

The bones of the hand comprise eight carpal bones at the wrist, five metacarpal bones, and fourteen phalanges (twelve finger bones and two thumb bones). Joints between the bones, shown in the next drawing, include the carpometacarpal joints (CMC joints), metacarpophalangeal joints (MCP joints), and interphalangeal joints (IP joints).



Right hand, dorsal surface

IP JOINT: Interphalangeal joint DIP JOINT: Distal interphalangeal joint PIP JOINT: Proximal interphalangeal joint MCP JOINT: Metacarpophalangeal joint CMC JOINT: Carpometacarpal joint

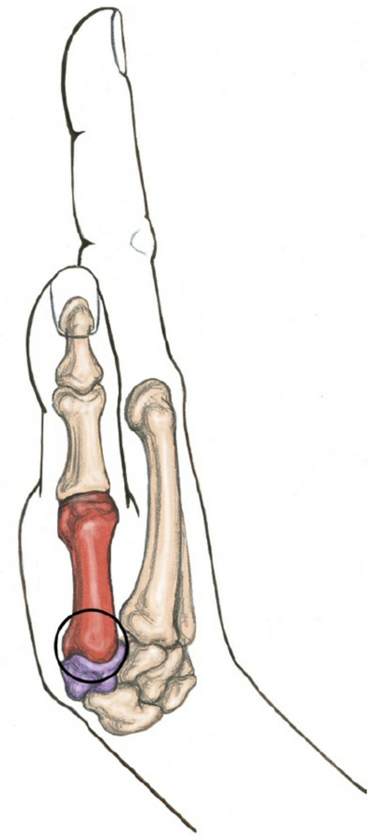
The *carpometacarpal joints* (pron., KAR-poe-met-tah-KAR-poll), or CMC joints,

are the joints between the carpal and metacarpal bones. All are classified as gliding/plane joints with the exception of the joint between the metacarpal of the thumb and the trapezium carpal bone, which is a saddle joint. There is very little movement at the CMC joints at the second and third metacarpals. Gliding movement occurs in the fourth and fifth metacarpals.

The CMC joint of the thumb has much greater movement capability than the other CMC joints because of the articulating ends on both the trapezium carpal bone and the metacarpal bone of the thumb. Thumb movements include flexion and extension, which are the bending and straightening of the thumb, and abduction and adduction, which are the moving of the thumb away from the palm in a forward direction and the return of the thumb to the side of the hand. These movements are shown in the drawings *Abduction and Adduction of Thumb at the CMC Joint* and *Flexion and Extension of Thumb at the CMC Joint*. Other thumb movements, not shown here, are opposition and reposition, in which the thumb moves across the palm to touch the tips of the fingers and then returns to its neutral position, circumduction, which is the circular movement of the entire thumb.

ABDUCTION AND ADDUCTION OF THUMB AT THE CMC JOINT

Saddle joint action

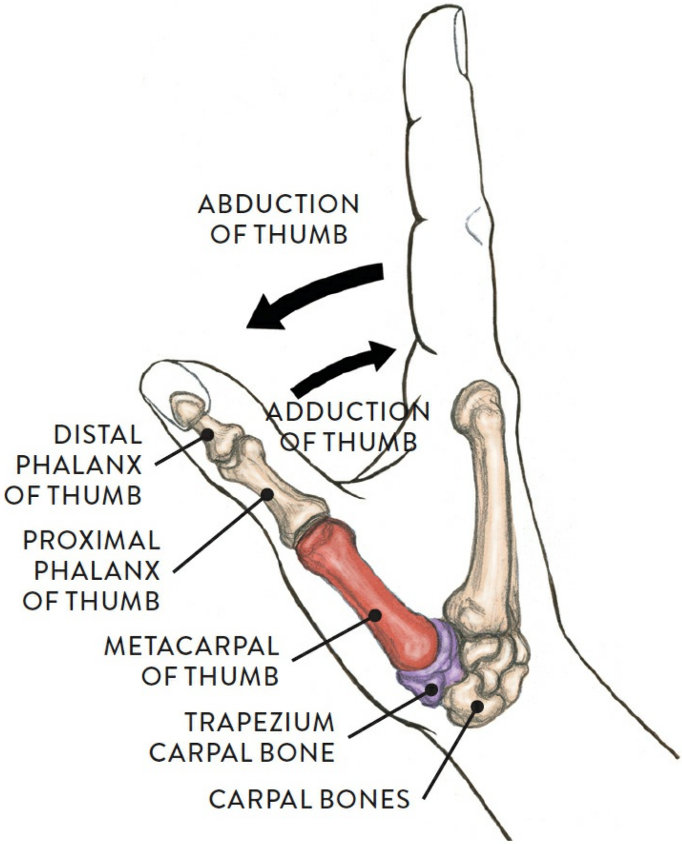


Neutral position of thumb

Circle indicates the CMC joint of thumb and the saddle joint.

ABDUCTION AND ADDUCTION OF THUMB AT THE CMC JOINT (CONTINUED)

Saddle joint action

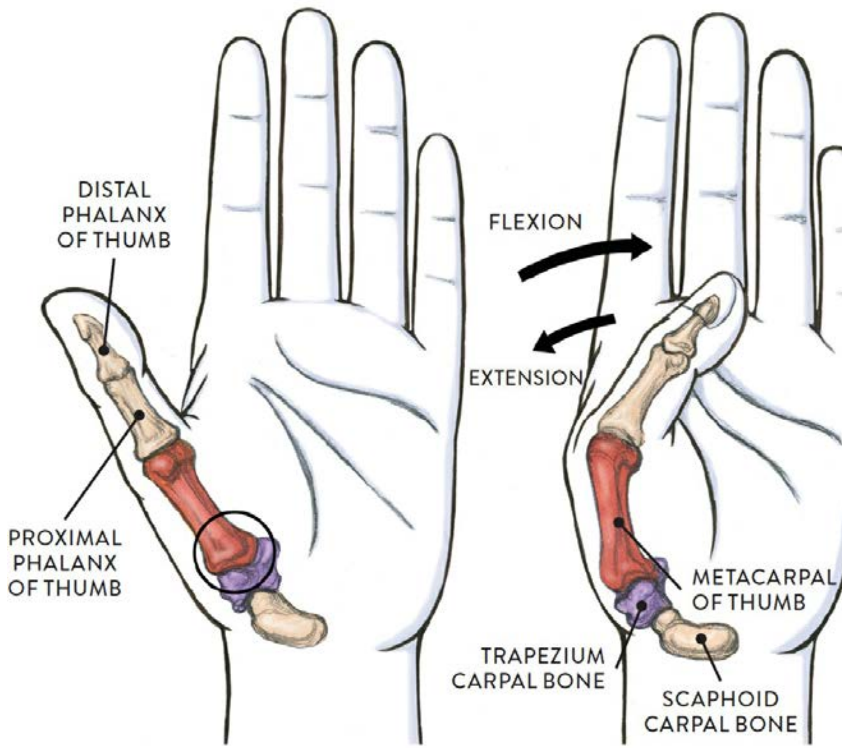


Lateral view of right hand

FLEXION AND EXTENSION OF THUMB AT THE CMC JOINT

Saddle joint action

In the action of flexion, the thumb is pulled across the palm. The reversal of this action is extension.



Circle indicates the CMC joint of the thumb and the saddle joint.

LEFT: Palmar view of left hand

RIGHT: Thumb moving from the CMC joint

The *metacarpophalangeal joints* (pron., MET-ah-KAR-poe-fah-LAN-jee-ul), or MCP joints, are the joints between the metacarpal bones and the phalanges (finger bones and thumb bone) and are classified as ellipsoid/condyloid joints. The heads of the metacarpals (commonly referred to as the *knuckles of the hand*) appear near the surface when the fingers and thumb bend at the MCP joints. When the fingers or thumb extend or straighten, the knuckles are no longer visible on the surface.

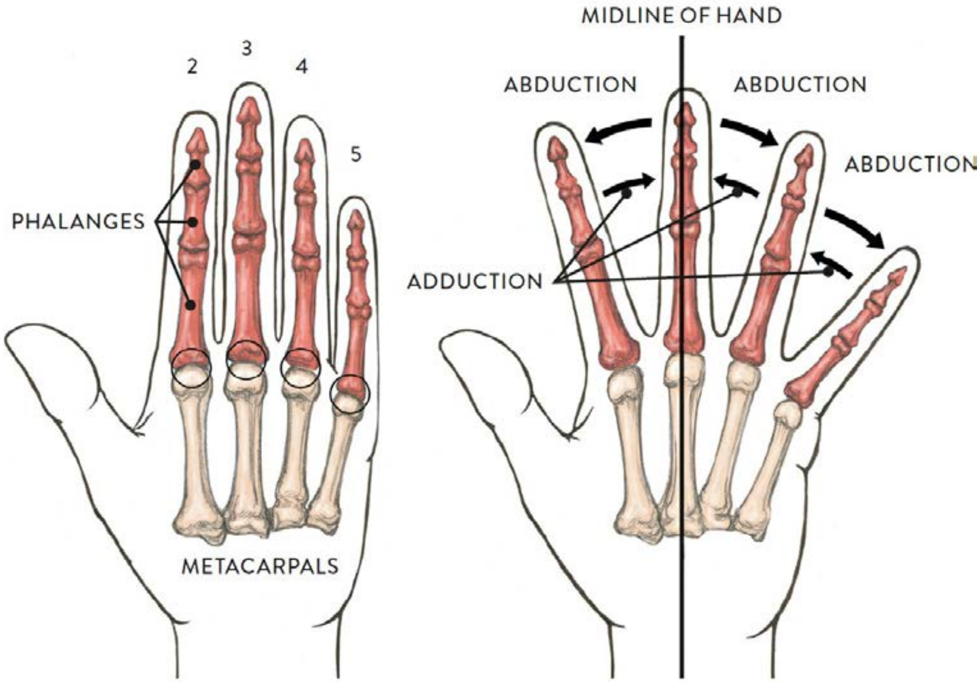
The movements of the fingers at the MCP joints are flexion and extension (bending and straightening of the fingers at the MCP joint), abduction and adduction (the spreading of

fingers and the return of the spread fingers to normal position), and circumduction, which is the circular movement of a whole finger (not shown in drawing).

In the drawing *Abduction and Adduction of Fingers at the MCP Joints,* we see the action of spreading the fingers apart and back. The third finger (middle finger) remains stabilized in the movements of abduction and adduction and is considered the *midline of the hand.* The second finger moves sideways away from the third finger, and the fourth and fifth fingers move sideways away from the third finger in the other direction.

ABDUCTION AND ADDUCTION OF FINGERS AT THE MCP JOINTS

Ellipsoid/condyloid joint actions



Circles indicate MCP joints.

LEFT: Fingers in straight alignment to the palm—palmer view of the left hand

RIGHT: Fingers spreading outward from the midline is abduction; the reverse of this action is adduction

The movements of the thumb at the MCP joint, not shown here, are flexion and extension. Flexion is the bending together of the two phalanges of the thumb at the MCP joint; extension returns the two thumb phalanges back to their normal position. The thumb can also slightly rotate from its CMC joint because this joint is a saddle joint, allowing more movement than the ellipsoid/condyloid joint at the MCP.

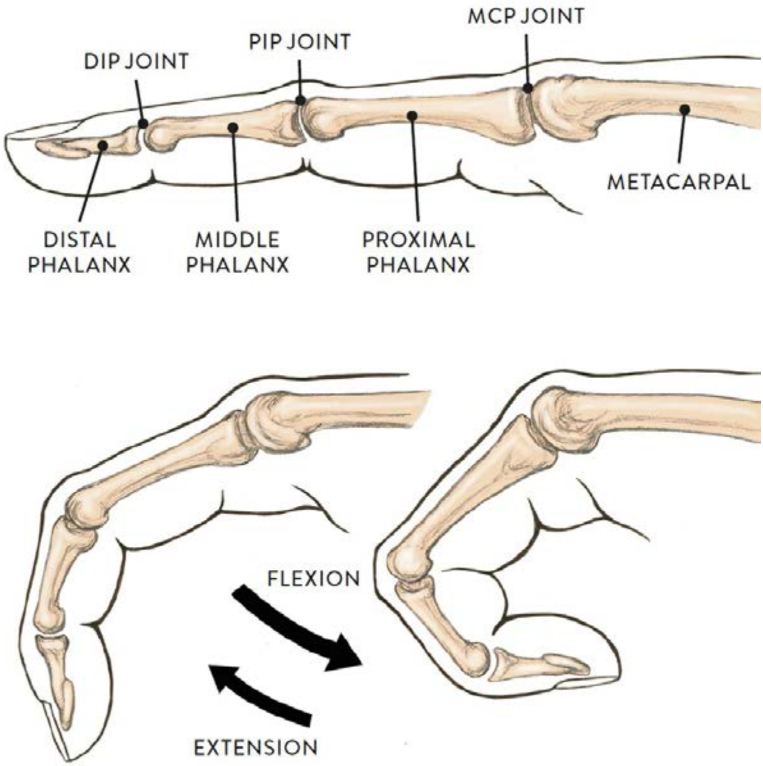
The *interphalangeal joints* (pron., in-ter-fah-LAN-jee-ul), or IP joints, are the joints between the phalanges; they are classified as hinge joints. They are also referred to as the knuckles of the fingers. The *proximal interphalangeal joint* (*PIP joint*) is located between the proximal phalanx (closer to wrist) and the middle (or intermediate) phalanx. The *distal interphalangeal joint* (*DIP joint*) is located between the distal phalanx (farther from wrist) and the middle (or intermediate) phalanx. The only movements the

fingers can produce at the IP joints (PIP and DIP) are flexion and extension—the bending and straightening of the phalanges (finger bones).

In the drawing *Flexion and Extension of Finger at the IP Joints,* we see a lateral view of the straight index finger and, below it, the movements of flexion and extension. In the movement of flexion the finger bones (phalanges) can either bend slightly or tightly curl the whole finger. Extension is the action of straightening the bones of the fingers from a flexed position. As mentioned, flexion and extension also occur at the knuckles (MCP joints) of the hand. The thumb (not shown) has only one IP joint, which also flexes and extends.

FLEXION AND EXTENSION OF FINGER AT THE IP JOINTS

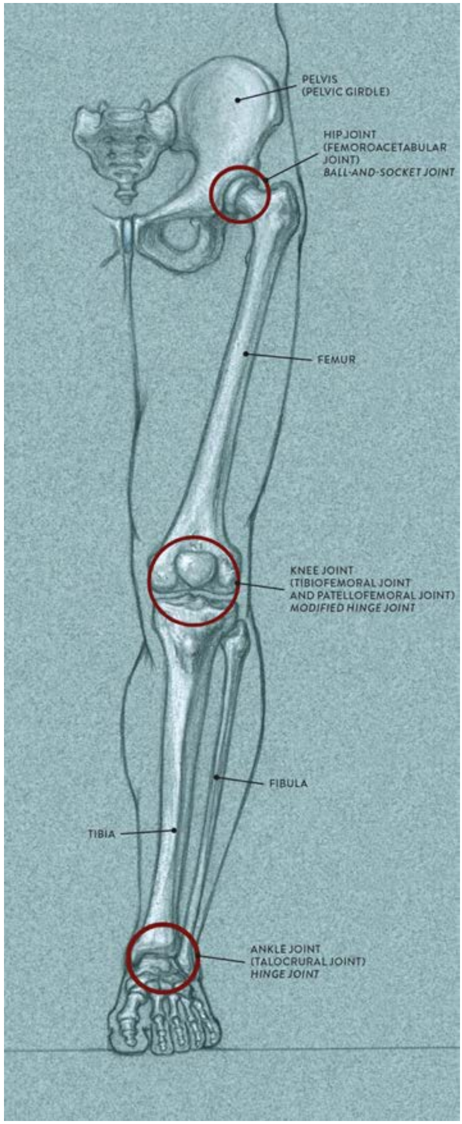
Hinge joint action



Lateral view of index finger of right hand

Joints of the Lower Limb

The main joints of the lower limb, shown in the drawing next, include the hip joint, knee joint, ankle joint, and the joints of the foot and toes. The pelvic girdle is considered to be an important component of this region because it is the supportive framework into which the lower limbs connect. Since we have already looked at the joints of the pelvis, we focus here on the joints of the lower limb to see how they function in various movements.



Left leg, anterior view

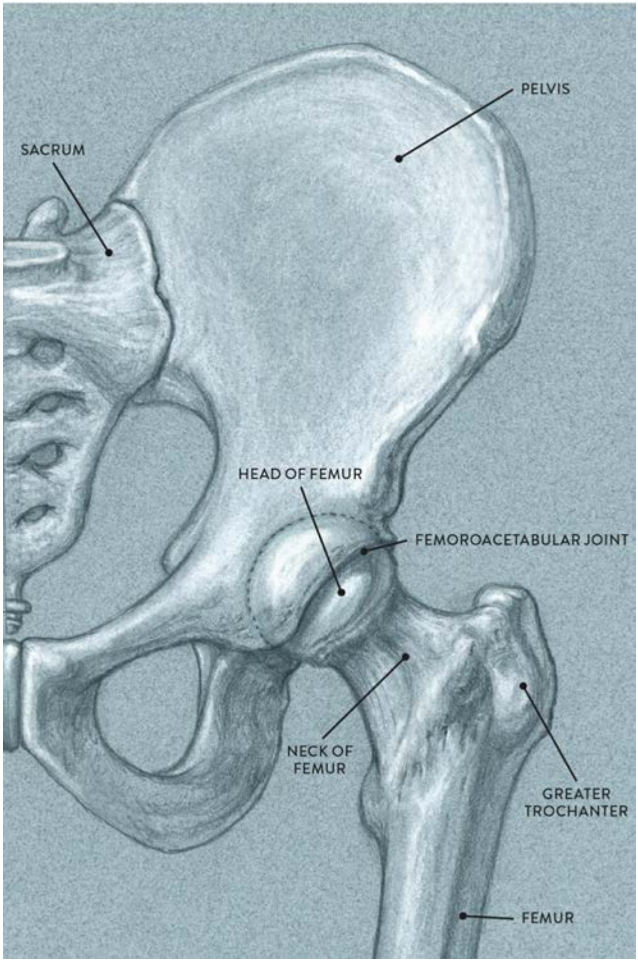
The Hip Joint

The hip joint, also called the *femoroacetabular joint* (pron., FEM-er-oh-ah-see-TAB-

byoo-lar), consists of the golf ball–shaped *head of the femur* and the cup-shaped socket (*acetabulum*) within the pelvis. The femur of the upper leg has the capability of moving in a wide variety of directions because of the shape of this ball-and-socket joint. The hip joint itself is hidden under ligaments and muscular forms and so cannot be seen on the surface; however, landmarks such as the greater trochanter of the femur can be detected, helping locate the general placement of the hip joint.

HIP JOINT (FEMOROACETABULAR JOINT)

Ball-and-socket joing



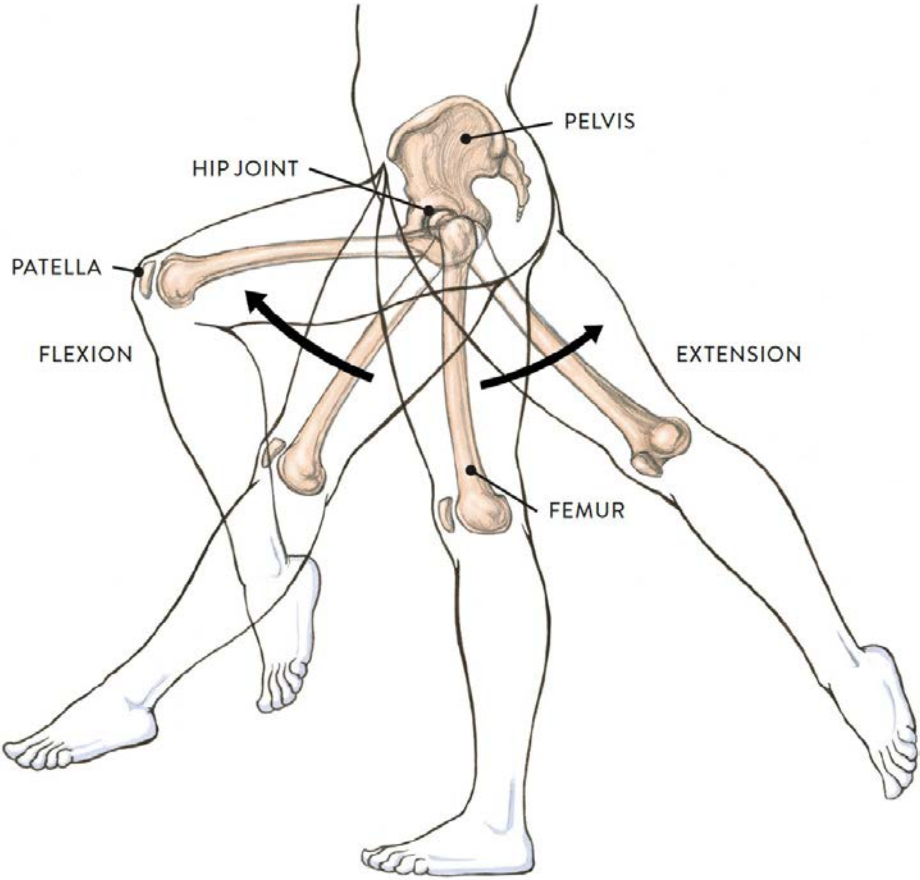
Anterior view of left side of pelvis and upper portion of femur

Movements produced at the hip joint include flexion and extension (moving the femur in forward-and-back directions), abduction and adduction (moving the femur sideways), lateral and medial rotation of the femur (rotating the femur outward or inward), and circumduction (circular motion of entire femur). In the drawing *Flexion and Extension of Femur at the Hip Joint,* we see the forward-and-back movements of the femur. In flexion, the upper leg can move forward with the lower leg bent or with the lower leg in

the same straight alignment as the upper leg. This action is seen in many dance movements and in sports actions such as kicking a ball. Extension is the return of the femur back to its normal position, or it can extend farther back, which is sometimes referred as hyperextension of the femur.

FLEXION AND EXTENSION OF FEMUR AT THE HIP JOINT

Ball-and-socket joint action

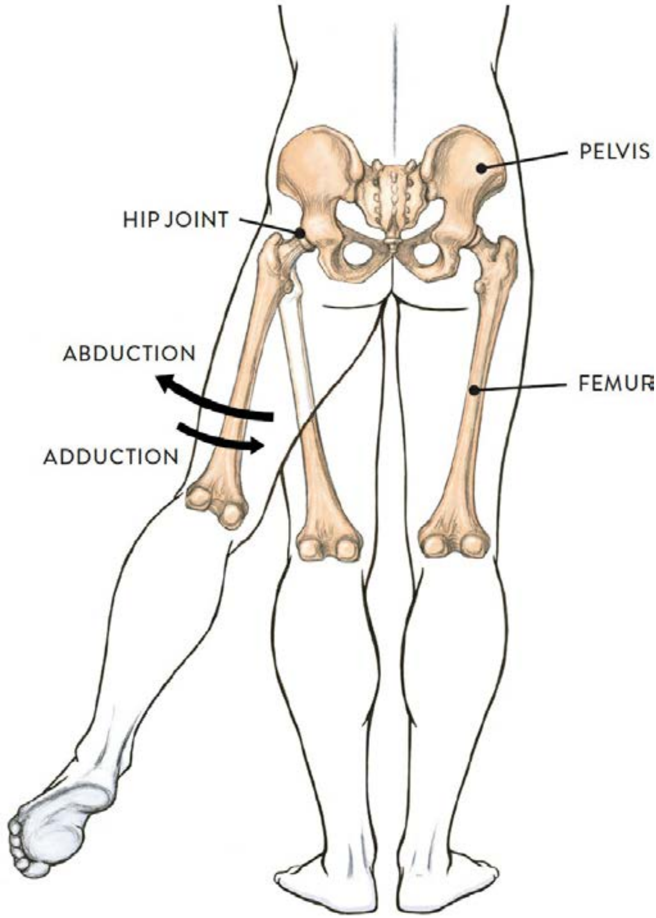


Lateral view of pelvis and left upper and lower leg

The drawing *Abduction and Adduction of Femur at the Hip Joint,* shows the side-to-side movements of the femur. Abduction is the action of moving the femur away from the medial line (midline) of the body. Adduction is the action of returning the femur back to its normal position. Adduction can go farther, moving the femur past the medial line, as in the action of crossing one leg past the other seen in many dance and sports movements.

ABDUCTION AND ADDUCTION OF FEMUR AT THE HIP JOINT

Ball-and-socket joint action

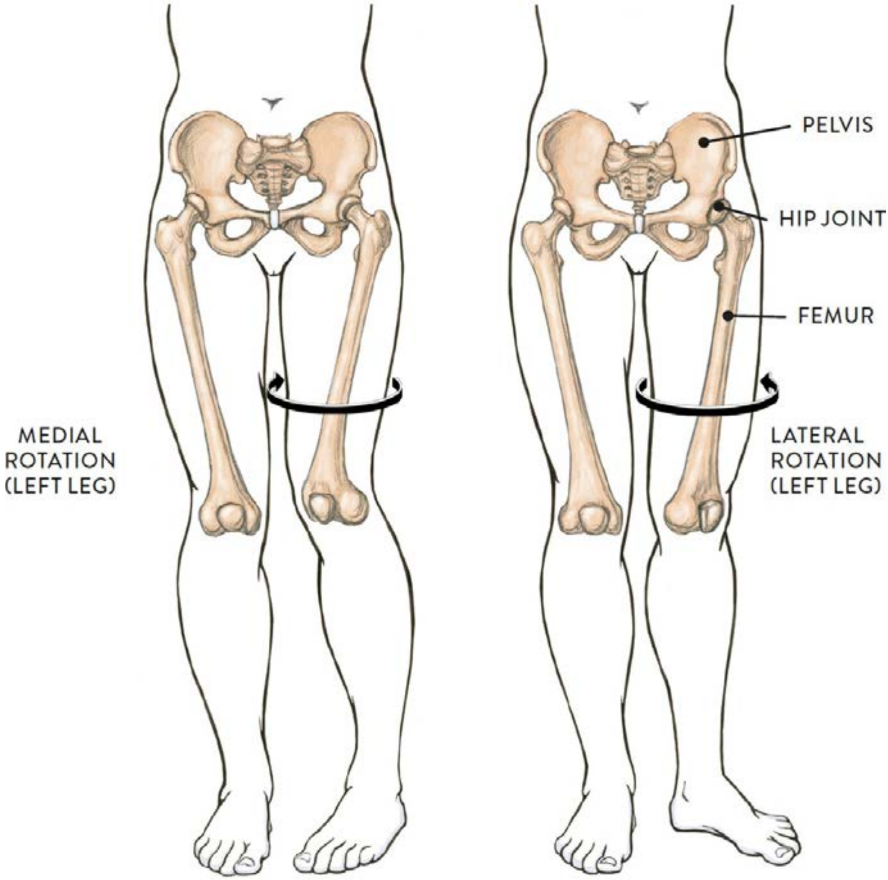


Posterior view of the pelvis and upper and lower legs

Next, in the drawing *Lateral and Medial Rotation of Femur at the Hip Joint,* we see the rotation of the whole femur, which means the bone is rotating or twisting on its own axis. Medial rotation is rotating the femur toward the midline of the torso; lateral rotation is rotating the femur away from the midline. Both medial and lateral rotation can be combined with other movements.

LATERAL AND MEDIAL ROTATION OF FEMUR AT THE HIP JOINT

Ball-and-socket joint action



Anterior view of the pelvis and upper and lower legs

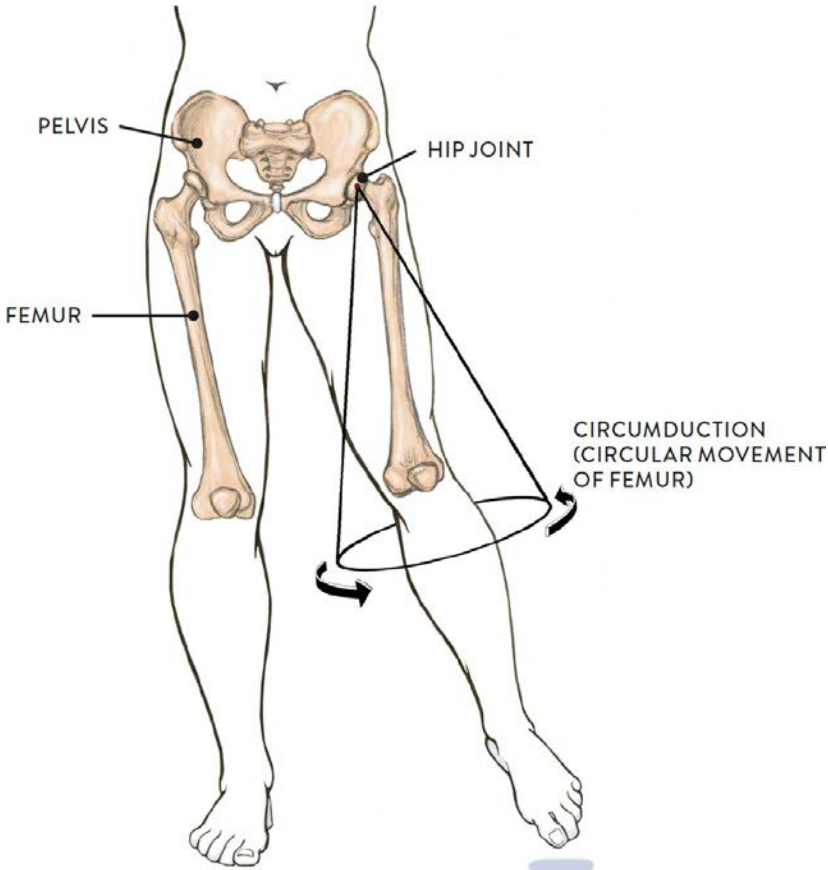
Medial and lateral rotation of left leg with a stationary pelvis

Finally, the drawing *Circumduction of Femur at the Hip Joint,* shows the circular action of the femur. Circumduction is often confused with the rotation of the femur. The difference is that, in circumduction, the whole femur (or thigh) is moving in a circular manner while the head of the femur remains somewhat stabilized in the hip joint, while in rotation the femur is turning on its own axis. The movement of circumduction is essentially that of drawing an imaginary circle with the foot or knee. It can be performed in either a clockwise or counterclockwise direction, and the circular motion can be

broader or narrower.

CIRCUMDUCTION OF FEMUR AT THE HIP JOINT

Ball-and-socket joint action



Anterior view of the pelvis and upper and lower legs

The Knee

The knee, which is the largest synovial joint in the body, actually consists of two different joints: the tibiofemoral joint, located between the condyles of the femur bone and the condyles of the tibia, and the patellofemoral joint, which is the joint between the lower anterior portion of the femur bone and the patella. The bones of the knee joint are encased in and connected together by strong cartilages and ligaments.

Names of Knee Joints

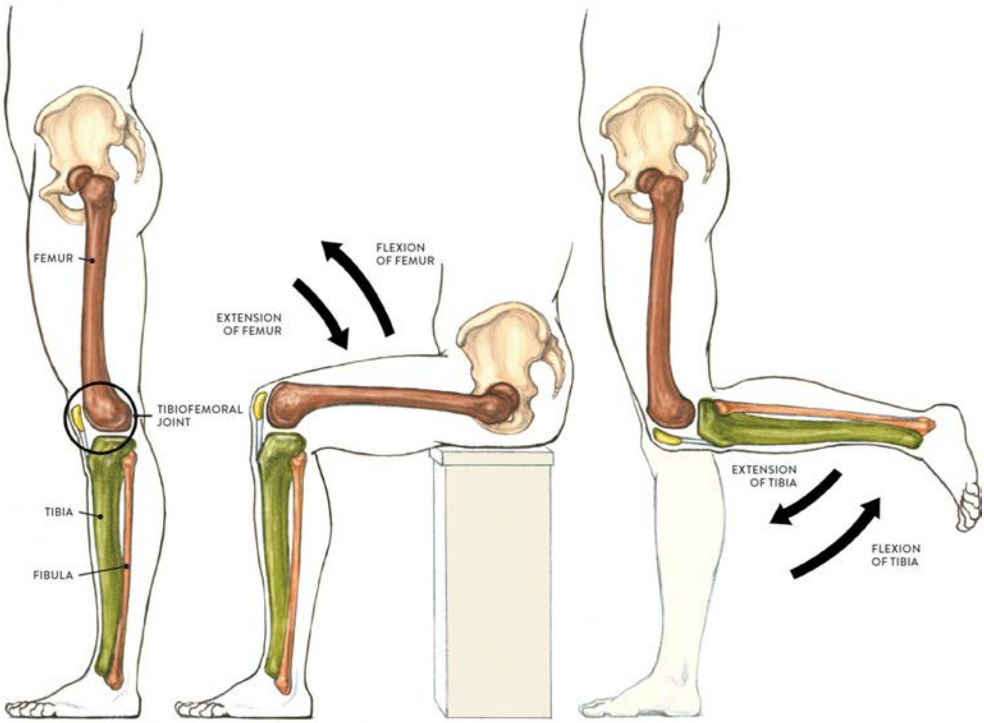
The names of knee joints provide clues to their location:

- *Tibio* pertains to the tibia bone of the lower leg.
- *Femoral* pertains to the femur bone of the upper leg.
- *Patello* pertains to the patella (kneecap).

The *tibiofemoral joint* (pron., TIB-ee-o-FEM-or-al) consists of the condyles of the femur and the condyles of the tibia. In the drawing *Movement of the Tibia or Femur at the Tibiofemoral Joint of the Knee,* we see the knee movements of flexion and extension, in which the femur condyles roll and glide on top of the tibia condyles. These actions occur when bending and straightening the lower leg, as when kicking a ball, or when bending and straightening the upper leg over a fixed lower leg, as in the actions of sitting down and standing up. In the action of sitting, the hip joint is also activated. During flexion and extension, there is also a slight lateral rotation or medial rotation of the femur condyles; because of these additional minimal movements, the tibiofemoral joint is considered a modified hinge joint.

MOVEMENT OF THE TIBIA OR FEMUR AT THE TIBIOFEMORAL JOINT OF THE KNEE

Modified hinge joint action between the condyles of the femur and tibia



Lateral view of the pelvis and left leg

LEFT: Neutral position

CENTER: Sitting down and standing up

RIGHT: Lifting and lowering lower leg

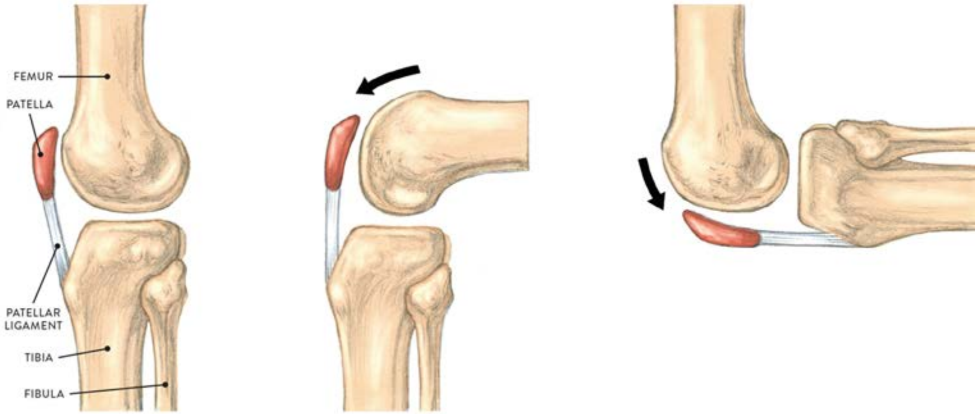
The second articulation of the knee joint is the *patellofemoral joint* (pron., puh-TELL-o-FEM-or-al). This joint between the femur and the patella is considered a gliding/plane joint. The quadriceps tendon runs along a smooth, slightly indented surface on the femur called the *patellar surface of the femur,* which is located between the two anterior femoral condyles. The tendon attaches into the patella, embedding it in its fibers. The *patellar ligament,* a straplike form, continues from the lower portion of the patella to attach on the *tibial tuberosity,* which is a noticeable small protrusion on the upper part of the tibia. The quadriceps tendon, patella, and the patellar ligament act like a cable moving between the large condyles of the femur, which are shaped somewhat like a

pulley.

The drawing *Movement of the Patella at the Patellofemoral Joint of the Knee,* shows how the patella (kneecap) moves during flexion and extension of the knee region. The kneecap moves in slightly upward and downward directions during flexion and extension. Various ligaments attach into the patella to keep it from moving side to side. When the quadriceps muscle contracts on a standing leg, the patella is pulled upward from its normal position.

MOVEMENT OF THE PATELLA AT THE PATELLOFEMORAL JOINT OF THE KNEE

Gliding joint action between the patella and femoral condyles



Lateral view of left knee joint

LEFT: Neutral position

CENTER: Upper leg bending with fixed lower leg

RIGHT: Lower leg bending with fixed upper leg

When knee is bent (as shown in CENTER and RIGHT images), the patella glides on the patellar surface of the femur, moving slightly downward.

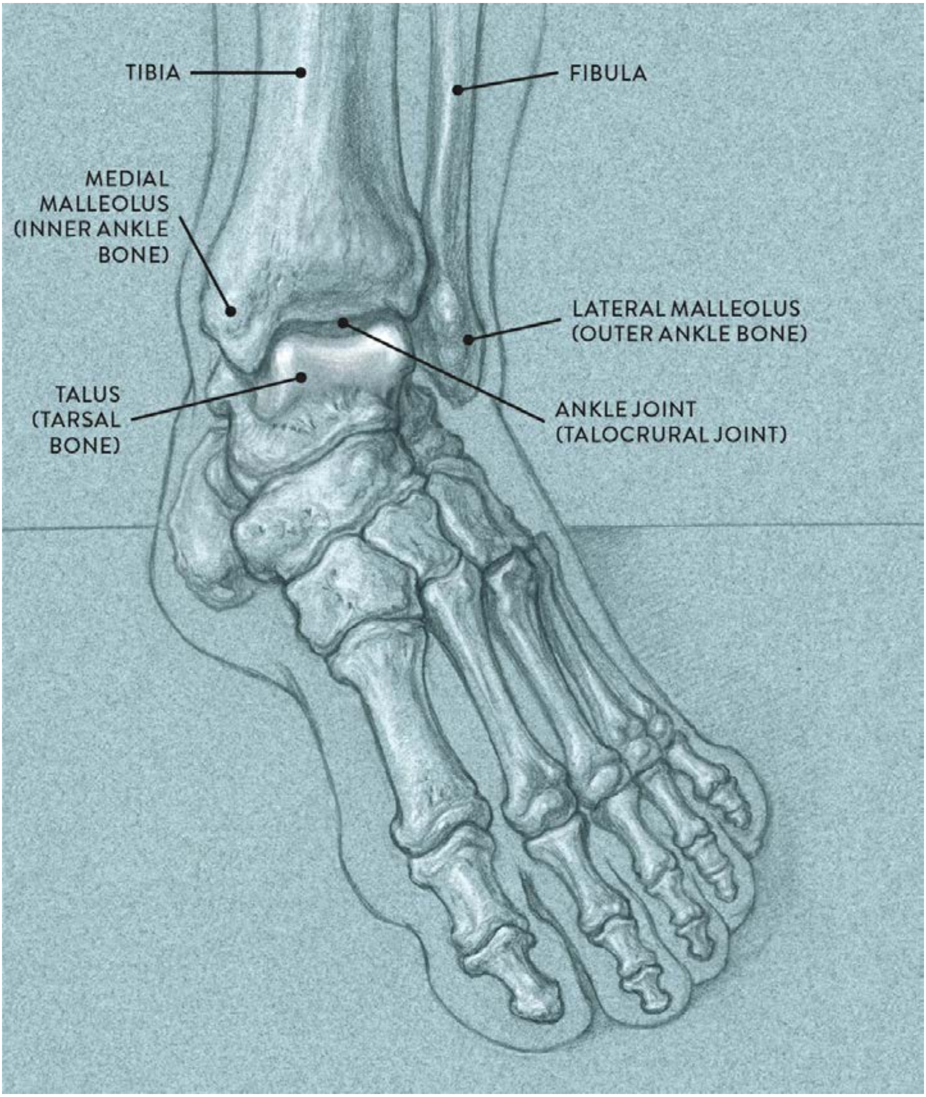
The Ankle Joint

The ankle joint, also called the *talocrural joint* (pron., TAY-lo-KROO-rul) joins three bones: the lower portions of both the tibia and the fibula bones and the upper portion of the talus bone of the foot. These bones help support the weight of the body and also play an important role in locomotion. The ankle joint is classified as a hinge joint.

As shown in the drawing, the upper portion of the talus (the *trochlear portion* or *talar dome*) is smooth and somewhat dome-shaped and is wedged between, or gripped by, the two ankle bones—the *lateral malleolus of the fibula* (outer ankle) and *medial malleolus of the tibia* (inner ankle).

ANKLE JOINT (TALOCRURAL JOINT)

Hinge joint



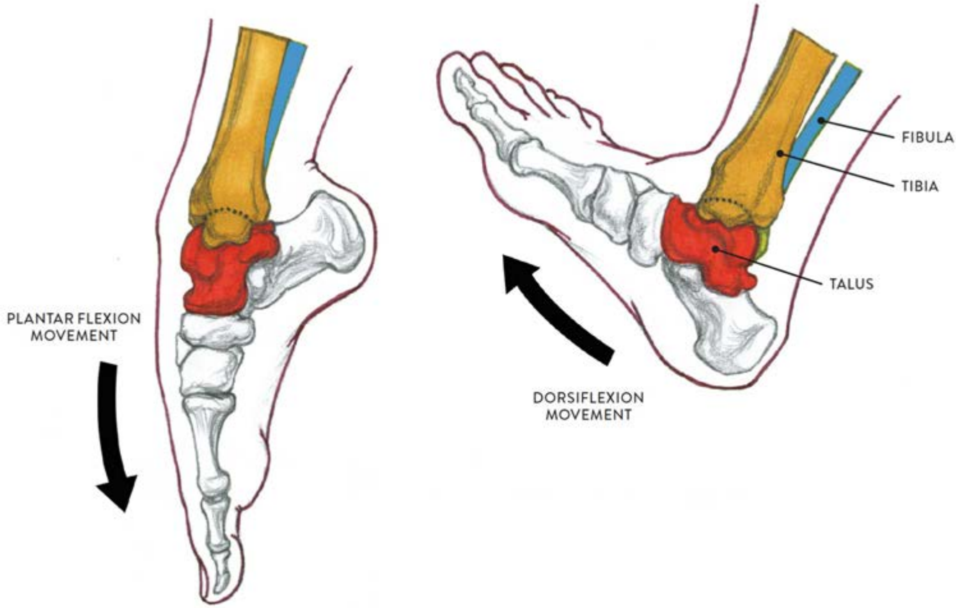
Three-quarter anterior view of the left foot and ankle region

In the drawing *Dorsiflexion and Plantar Flexion at the Ankle Joint,* we see how the foot moves in up and down directions at the ankle joint. Dorsiflexion is lifting or swinging the front part of the foot upward and pushing the heel downward. In this

particular movement, the toes tend to spread apart slightly. This movement occurs in walking and running, preventing the toes from scraping the ground when the foot moves forward in a stride. Plantar flexion is the pointing of the front portion of the foot downward and lifting the heel upward. In this action, the toes tend to push together, as can be seen in many ballet movements. This hingelike action propels the body forward in movements such as walking, running, and leaping.

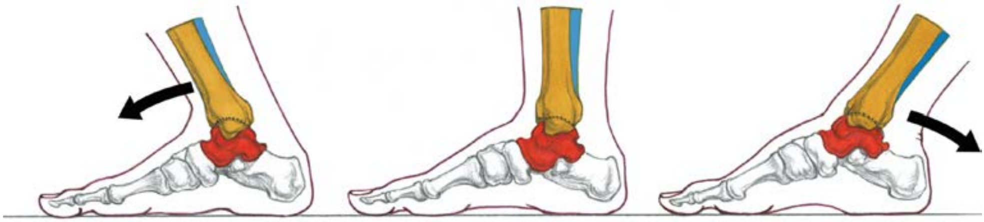
DORSIFLEXION AND PLANTAR FLEXION AT THE ANKLE JOINT

Hinge joint action



Non-weight-bearing positions (foot suspended above ground)

Hinge joint action



Weight-bearing positions (foot placed on the ground)

LEFT: Lower leg leans forward, with arch pressed lower to the ground

CENTER: The foot is in neutral position, with normal arch

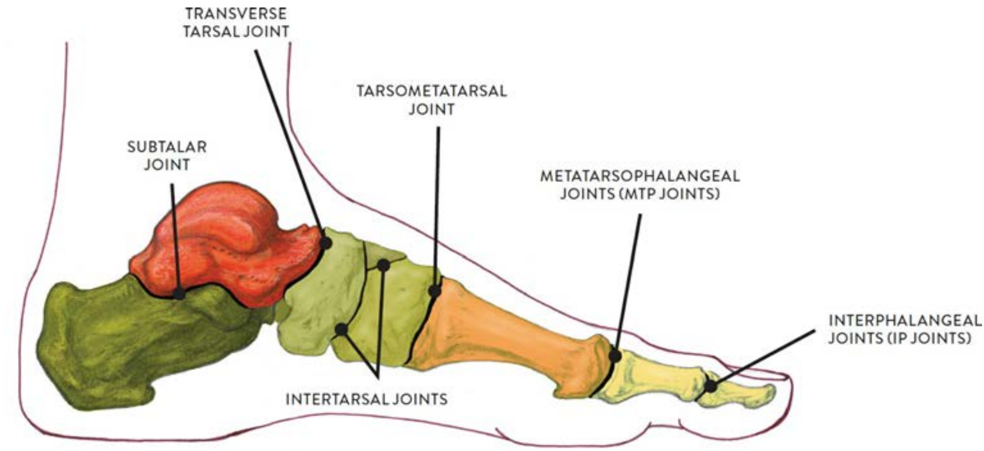
RIGHT: Lower leg leans back, with arch raised higher

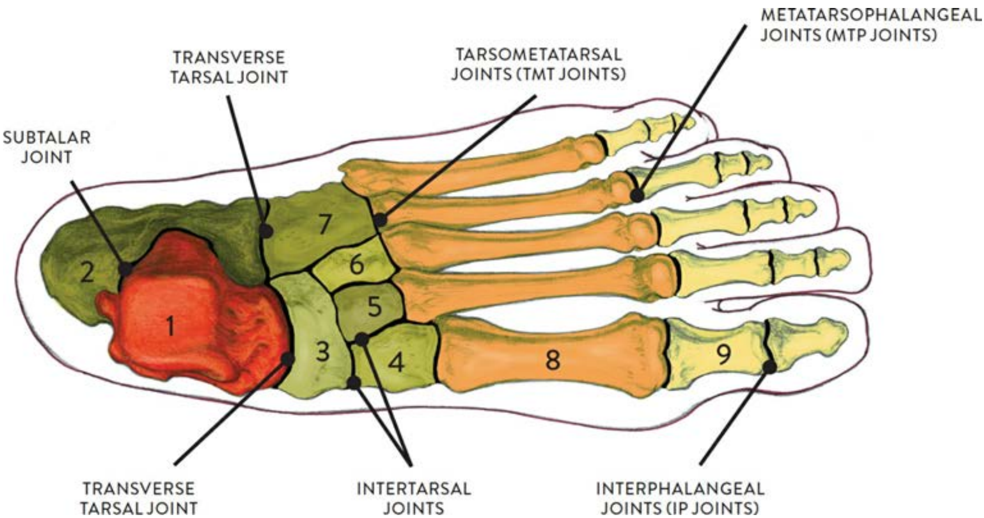
The Joints of the Foot

As Leonardo da Vinci noted, the human foot is a masterpiece of engineering. It is not only capable of supporting the weight of the entire body but also serves as a biomechanical structure helping propel the body in various movements, both horizontally (walking, running) and vertically (jumping).

The bones of the foot comprise seven tarsal bones, five metatarsal bones, and fourteen phalanges (toe bones). The joints of the foot, shown in the drawing on this page, are organized into several groups. The first consists of the joints of the tarsal bones: the subtalar joint, tranverse tarsal joint, tarsometatarsal joints (TMT joints), and various small intertarsal joints. Then there are the joints between the metatarsals and toe bones (the metatarsophalangeal joints, or MTP joints) and the joints of the toes (the interphalangeal joints, or IP joints). Most of the joints between the tarsal bones are considered gliding joints.

THE JOINTS OF THE FOOT





Superior view of left foot

NAMES OF BONES
1. talus
2. calcaneus
3. navicular
4. cuneiform (medial)
5. cuneiform (middle)
6. cuneiform (lateral)
7. cuboid
8. metatarsal
9. phalanx

Intertarsal joints is the collective name for the many joints between the tarsal bones of the foot. Most important are the subtalar joint, tranverse tarsal joints, and tarsometatarsal joints, but there are also numerous little joints between the three cuneiform tarsal bones and the cuboid and navicular tarsal bones. Each of these smaller joints has its own name, but they are identified in the drawings simply as intertarsal joints.

The *subtalar joint* (pron., SUB-TAL-ar) is the primary tarsal joint of the foot. This is the joint between the lower portion of the talus bone and the upper portion of the calcaneus bone. It is classified as a gliding joint.

The *transverse tarsal joint* (pron., TAR-sal) is a combination of two joints: One joint is between the talus and navicular tarsal bones and is classified by some experts as a modified ball-and-socket joint because of its convex and concave surfaces. Its movements, however, are limited. The other is between the calcaneus and cuboid tarsal bones and is considered a gliding joint. This combination of joints travels across the foot, hence the term *transverse.*

The *tarsometatarsal joints* (pron., TAR-so-MET-a-tar-sal) are the joints between the tarsal bones (cuneiform #1–3 and cuboid) and the proximal ends of the metatarsal bones. They are gliding joints. In weight-bearing movements such as walking, running, and jumping, these joints can alter the general shape of the arches by flattening the foot or “cupping” the foot, depending on the action.

Names of Foot Joints

The names of foot joints provide clues to their location:

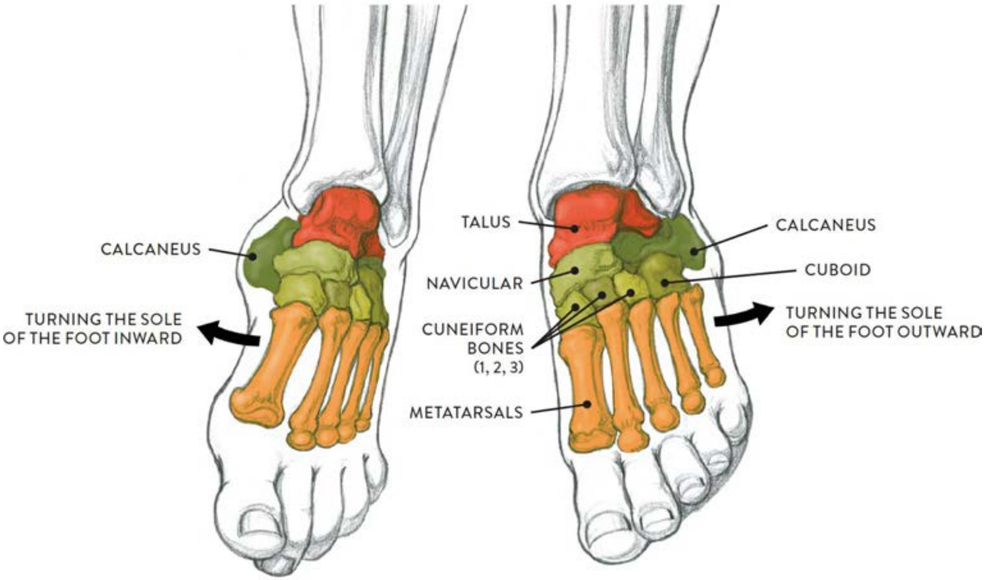
- *Tarso* pertains to the tarsal bones.
- *Talo* or *talar* pertains to the talus (a tarsal bone).
- *Metatarso* pertains to the metatarsal bones.

- *Phalangeal* pertains to the phalanges (toe bones).
- *Calcaneo* pertains to the calcaneus (heel bone).
- *Transverse* means “lying across the long axis of a body part” (in this case, the foot).
- *Inter* means “in between.”
- *Sub* means “beneath” (a prefix to other terms).

The movements of eversion and inversion of the foot are produced by gliding and sliding movements between the tarsal and metatarsal bones, combined with movements of dorsiflexion and plantar flexion. These subtle movements are necessary to keep the body balanced when walking on unstable ground, such as a rocky path or sandy terrain. They are also implemented in sports actions such as cupping the foot when hitting a soccer ball or turning the flattened foot outward in martial-arts kicking maneuvers. In the drawing *Eversion and Inversion of Foot at the Tarsal and Metatarsal Joints,* we see how the foot can bend slightly outward or inward. Eversion is turning the sole or bottom of the foot outward, away from the midline of the body, as when hitting a hacky sack with the outer edge of the foot. Inversion is turning the sole or bottom of the foot toward the midline of the body, as when you look at the bottom of your foot with the sole curling toward you. Inversion can also often be seen in soccer, when a player lifts the ball with the inner edge of the foot.

EVERSION AND INVERSION OF FOOT AT THE TARSAL AND METATARSAL JOINTS

Gliding joint action



LEFT: Inversion of left foot

RIGHT: Eversion of left foot

The two main types of toe joints are the metatarsophalangeal joints (MTP joints) and the interphalangeal joints (IP joints). The movements of the toes, while not as dynamic as those of the fingers, are nonetheless important in the gait mechanics of walking, running, and other actions. When, in walking, the foot moves off the ground and swings in a forward direction, the toes extend upward and spread slightly to avoid being dragged against the ground. As the foot lands, the toes flex or bend and then “grip” the ground as a stabilizing maneuver.

The *metatarsophalangeal joints* (pron., MET-a-TAR-so-fa-lan-GEE-al), or MTP joints, are the joints between the heads of the metatarsals and the bases of the phalanges (toe bones). They are considered ellipsoid/condyloid joints.

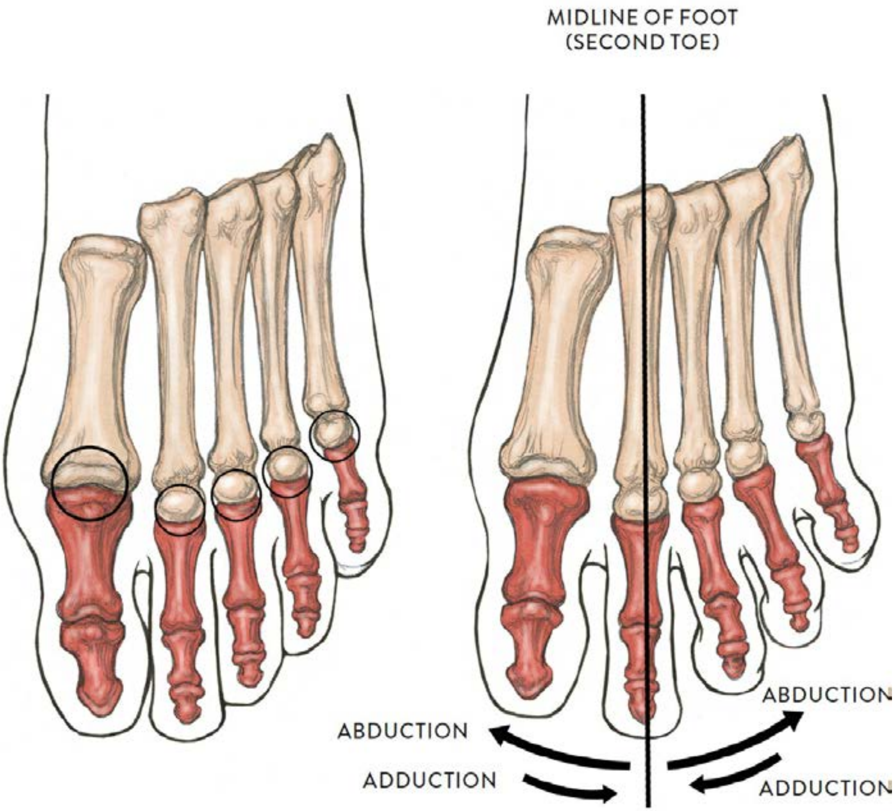
The *interphalangeal joints* of the foot (pron., IN-ter-fa-lan-GEE-al), or IP joints, are the joints between the toe bones (phalanges) and are considered hinge joints.

Movements at these joints include abduction and adduction (spreading the toes away from the midline of the foot and then bringing them back together) and flexion and extension (bending and straightening the toes). These actions are shown in the drawings

Abduction and Adduction of Toes at the MTP Joint and *Flexion and Extension of Toes at the MTP and IP Joints*.

ABDUCTION AND ADDUCTION OF TOES AT THE MTP JOINT

Ellipsoid/condyloid joint action



Superior view of left foot

Circles indicate the MTP joints and the ellipsoid/condyloid joints

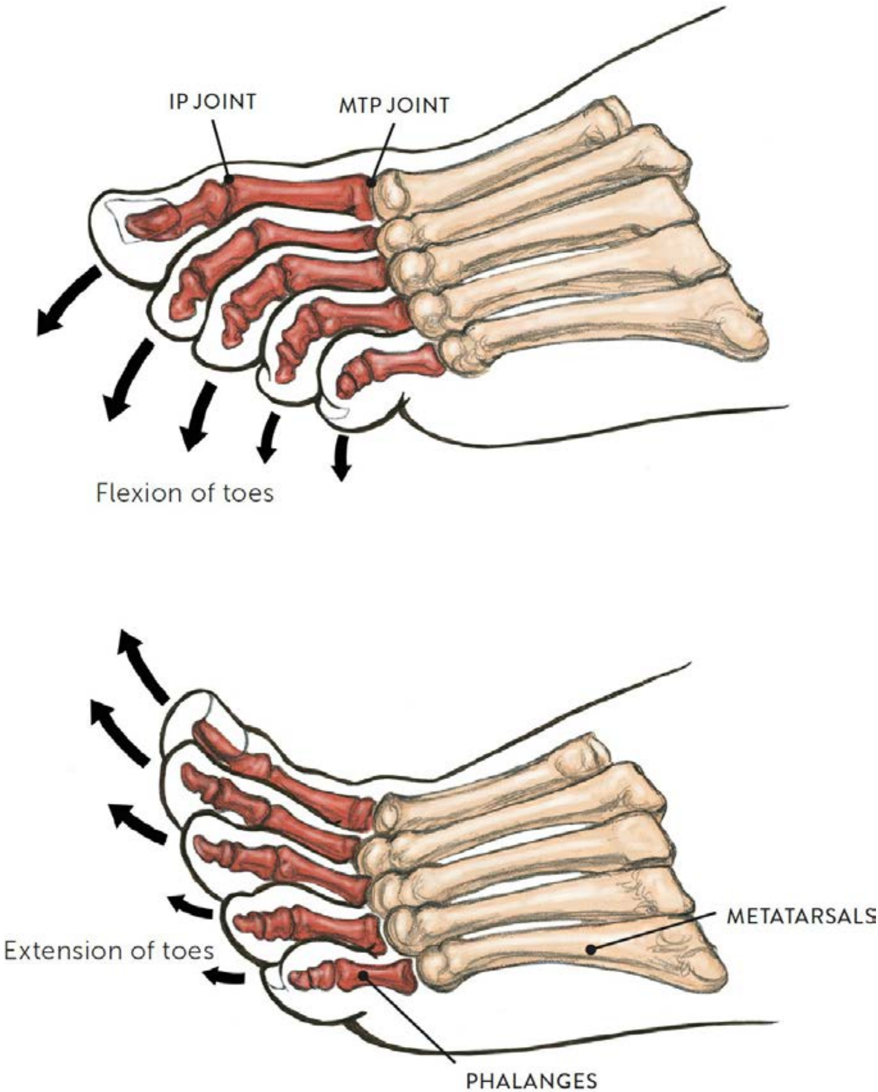
LEFT: Neutral position of toes

RIGHT: Toes moving at the MTP joint

Abduction is the movement of the great toe and the third, fourth, and fifth toes away from the second toe (midline). Adduction is the reverse of this action.

FLEXION AND EXTENSION OF TOES AT THE MTP AND IP JOINTS

Hinge joint action



Lateral view of left foot

SITTING ÉCORCHÉ FIGURE

Graphite pencil and colored pencils on light toned paper.

Chapter 3
Muscle and Tendon Characteristics

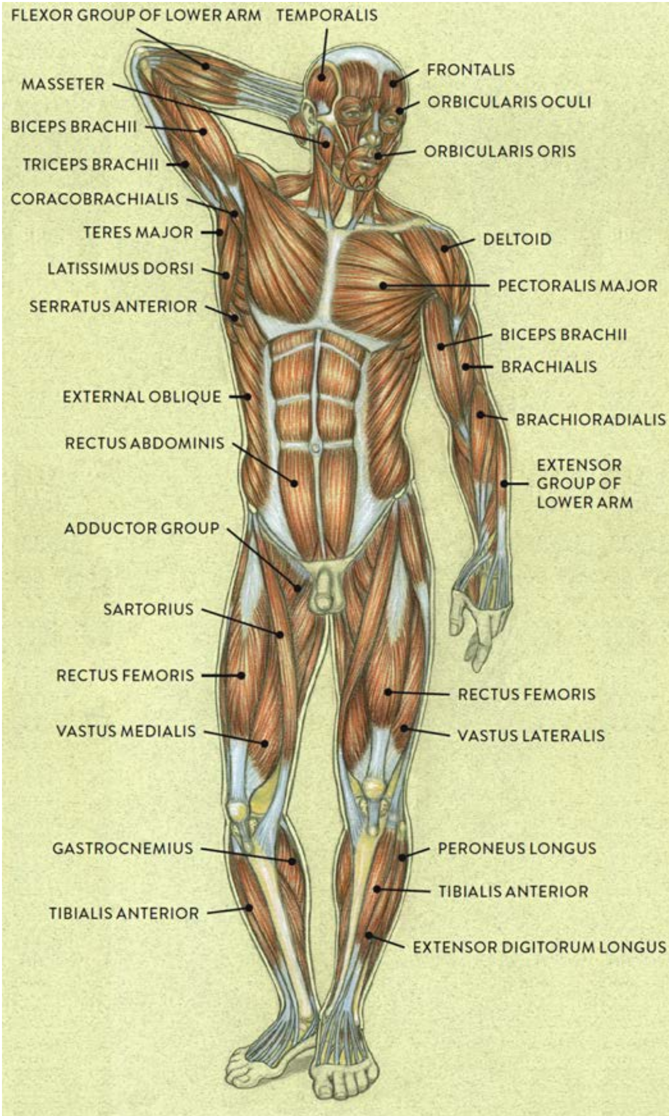
In this chapter, we introduce the basic traits of the skeletal muscles, their positions in the body, how they attach to bones, and how they maneuver the joints when they contract. We will also look at how muscles change shape in different movements. Tendons are also introduced, with a focus on their characteristics and how they influence the surface form. This basic information will be elaborated on in the following chapters on the muscle groups of different regions of the body.

Muscles, along with the subcutaneous layer of adipose (fatty) tissue, define the overall shape of the figure, "fleshing out" its structure and giving substance and character to the body. One of the many challenges in drawing the figure is to depict surface forms changing in various poses. Understanding the basic placement of muscles and how they stretch and compress in different movements will give you, as an artist, the advantage of knowing what occurs beneath the skin (and how that) influences what you see on the surface.

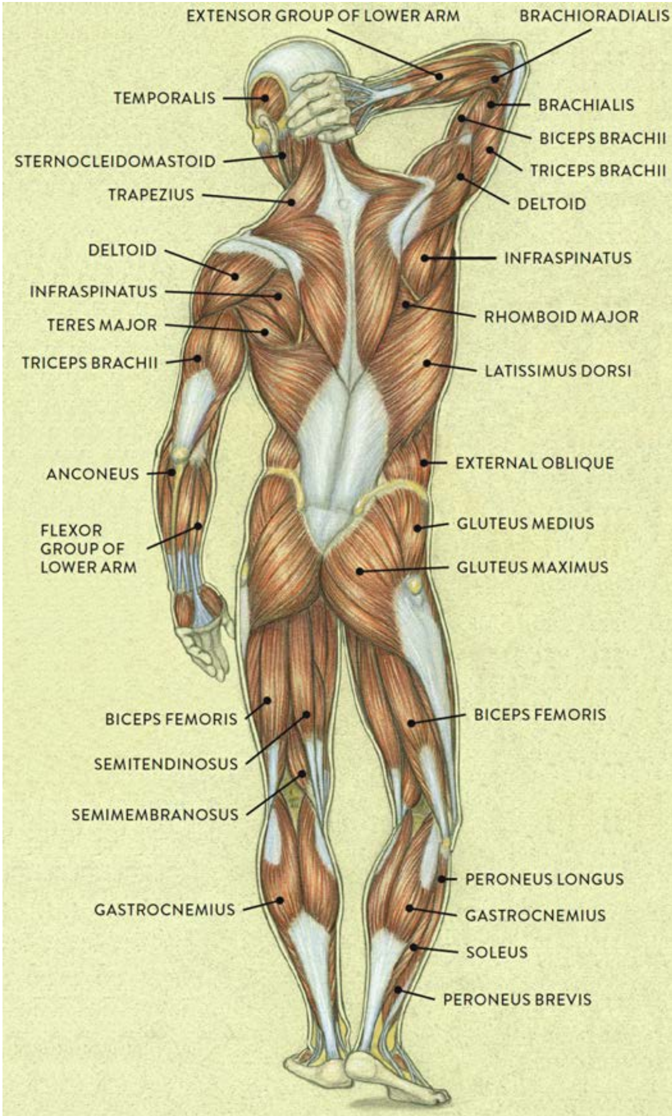
Figurative artists from centuries past up to the present have known the value of studying the human muscular system. When you view figurative works by painters and sculptors such as Michelangelo, Artemesia Gentileschi, Auguste Rodin, Peter Paul Rubens, and others, it's evident that these artists were well aware of anatomical forms and utilized that information to serve their artistic vision. Their knowledge of anatomy never overpowered their personal style or aesthetics—it only enhanced their work. Learning about the muscular system thus opens a creative door to many possible artistic options, whether you pursue an exacting anatomical realism, exaggerate bodily forms to create interesting visual dynamics, or explore a more expressive interpretation of the human form.

Let's begin by looking at the entire muscular system. The following drawings show the male and female figures in both anterior and posterior views.

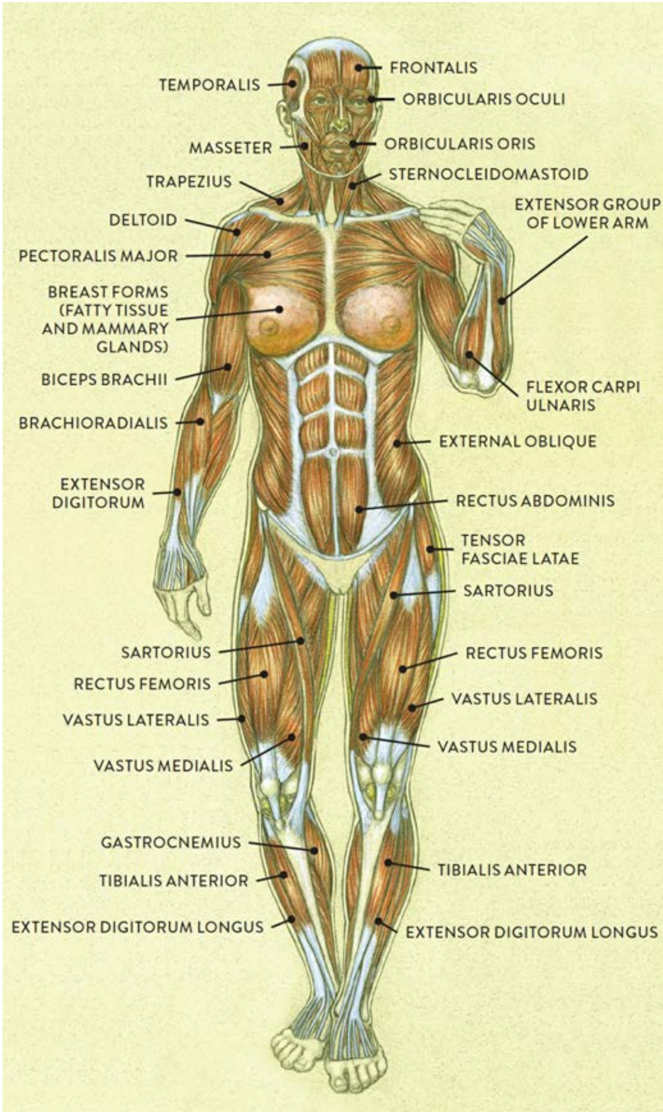
MUSCLES OF THE MALE FIGURE—ANTERIOR VIEW

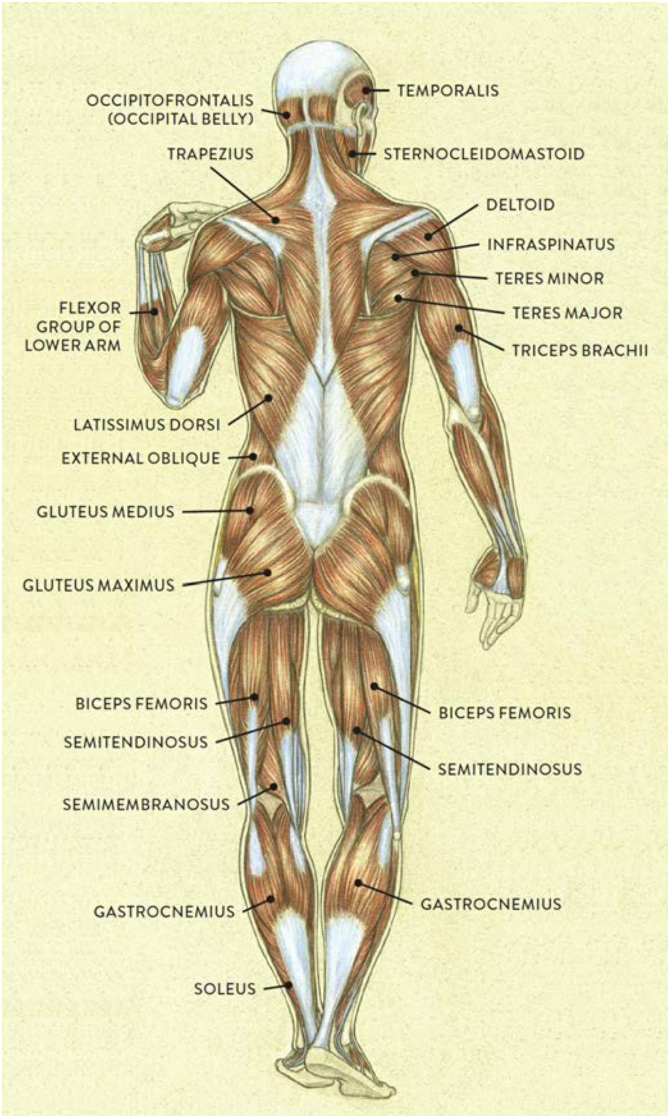


MUSCLES OF THE MALE FIGURE—POSTERIOR VIEW



MUSCLES OF THE FEMALE FIGURE—ANTERIOR VIEW





Muscles are situated within the body in two basic layers: the *superficial muscle layer* (also known as *externus* or *superficialis*) and the *deep muscle layer* (also called *internus* or *profundus*). Many figurative artists become familiar with the superficial layer when learning the basic anatomical forms of the body. With only a few exceptions, such as the sacrospinalis muscle of the back, the muscles of the deep layer do not

influence the surface forms and usually are not visible. Some anatomy books refer to a middle layer, called the *intermediate layer,* located in the lower arm, foot, and torso.

One way to become familiar with muscles is to categorize them into groups wherever possible. Besides being identified by the layer to which they belong, muscles can be grouped in a number of other ways, including the following:

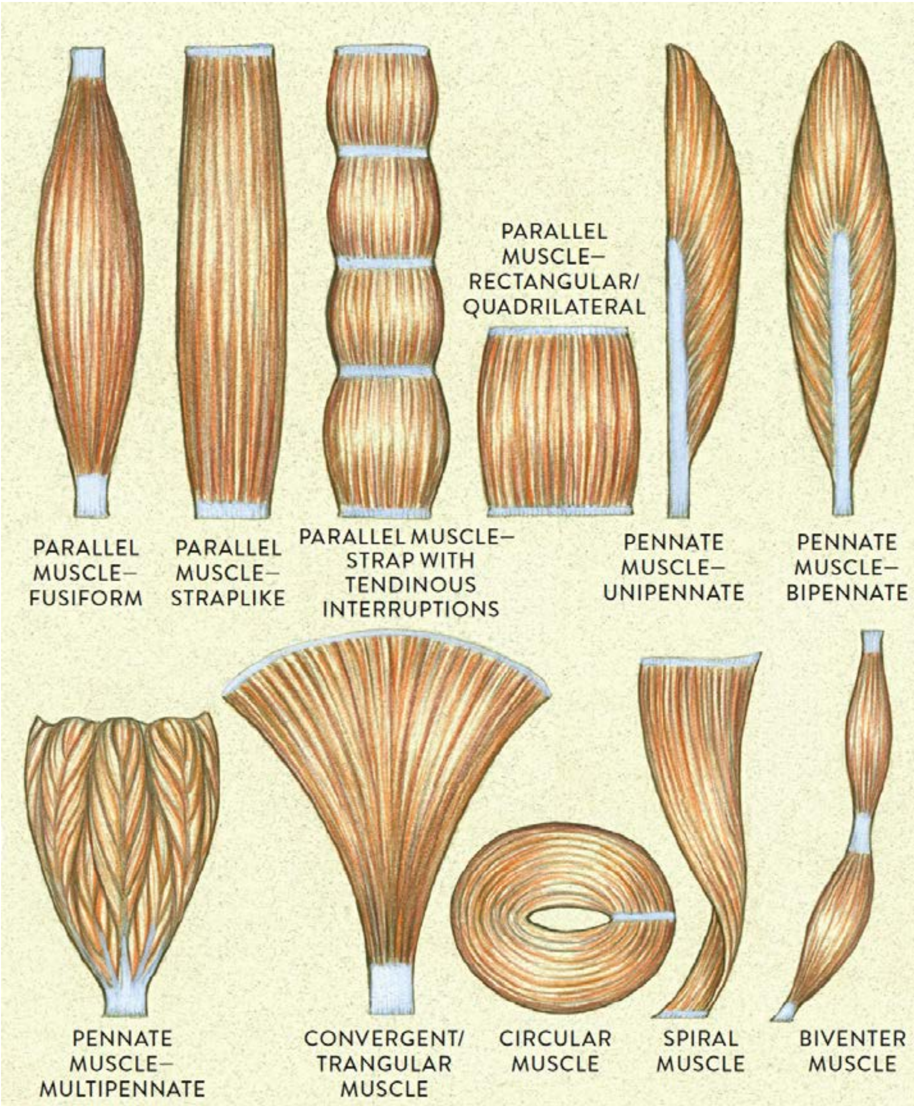
- By their function or action (e.g., flexor group, extensor group, adductor group)
- By their location in the body or by reference to other anatomical forms (e.g., gluteal group, abdominal group, pectoral group, scapula group, radial group, thenar group, peroneal group)
- By compartment, because muscles are separated into different compartments by deep fascia called *intermuscular septa* (e.g., anterior compartment, posterior compartment, medial compartment)
- By colloquial (common) names (e.g., thumb group, inner thigh group, upper thigh group, hamstring group)

Some muscles, such as the sartorius muscle of the upper leg, do not belong to any of these categories. These muscles assist in various movements while remaining independent of any group.

Skeletal Muscles

Beyond the groupings given above, muscles are classified as belonging to three basic types: *cardiac muscle* (pertaining to the heart), *smooth muscles* (usually affiliated with the tubular structures of the body, such as the arteries, colon, and bronchial tubes, as well as the iris of the eye), and *skeletal muscles.* As their name implies, the skeletal muscles attach to bones. It is the skeletal muscles that most interest artists because they are instrumental in creating bodily movement and because their shapes are often easy to see beneath the surface of the body.

The main function of skeletal muscles is to shorten, or contract, their overall shape to produce movement. To better understand how they accomplish this, we need to walk through muscles' basic internal structure. Muscles are composed of a series of elongated *muscle fibers* (muscle cells) that are grouped together in *muscle fiber bundles,* or *fascicles.* Even though muscle fibers are parallel to each other, they can be short, long, circular, fan shaped, or obliquely positioned on a tendon.



Arrangements of muscle fibers

Muscle Architecture

The varying lengths of muscle fibers affect the way muscles perform, with longer muscle

fibers producing a greater range of movement while shorter fibers generate more power in movement. *Muscle architecture* is the term usually applied to the arrangement of muscle fibers. There are several muscle-architecture classifications: *parallel, pennate, convergent/triangular, circular, spiral,* and *biventer*. More information about each category, including examples of muscles belonging to each, appears in the following table.

Skeletal Muscle Architecture

MUSCLE FIBER TYPE	DESCRIPTION	EXAMPLES
Parallel	Fibers run parallel to the length of the muscle. There are three subtypes:	
	Fusiform (muscle fibers with a bulging center)	biceps brachii (of upper arm)
	Straplike (elongated muscle fibers that follow the length of the muscle's axis)	sternocleidomastoid (of neck) sternohyoid (of neck) rectus abdominus (of abdomen; straplike with tendinous interruptions) sartorius (of upper leg)
	Rectangular/quadrilateral (shorter parallel fibers)	masseter (of jaw)
Pennate (pron., PEN-ate)	Fibers are attached at an oblique angle on a long tendon. There are three subtypes:	
	Unipennate (fibers attached on one side of an elongated tendon)	semitendinosus (of hamstring group)
	Bipennate (fibers attached on both sides of an elongated tendon)	dorsal interosseous muscles (of hand) rectus femoris (of upper leg)
	Multipennate (muscle contains many tendons, with fibers attached on both sides of each tendon)	deltoid (of shoulder)
Convergent/triangular	Fibers originate along a broader area of bone, then converge to a single tendon of insertion, producing a fan-shaped muscle.	pectoralis major (of chest) temporalis (of cranium)
Circular	Fibers are arranged in a circular fashion, creating concentric rings.	orbicularis oculi (of eye) orbicularis oris (of mouth)
Spiral	Fibers begin on one bone and then slightly spiral before inserting on a different bone.	latissimus dorsi (of torso) pectoralis major (clavicular head only) trapezius (of upper back and shoulder) brachioradialis (of arm)
Biventer	Muscle is split into two bellies by a tendon anchored by a fibrous sling.	digastric (of jaw) omohyoid (of neck)

Muscles' Internal Structure

Within each individual muscle fiber are elongated, rodlike strands, called *myofibrils,* that run parallel to each other and extend to the entire length of the muscle fiber. Myofibrils, in turn, contain a series of smaller units called *sarcomeres,* which are

positioned end to end inside the whole myofibril. And within each sarcomere are microscopic threads called *myofilaments.* The myofilaments are composed of contractile proteins of two different types—*myosin* and *actin*—and are specialized for contraction.

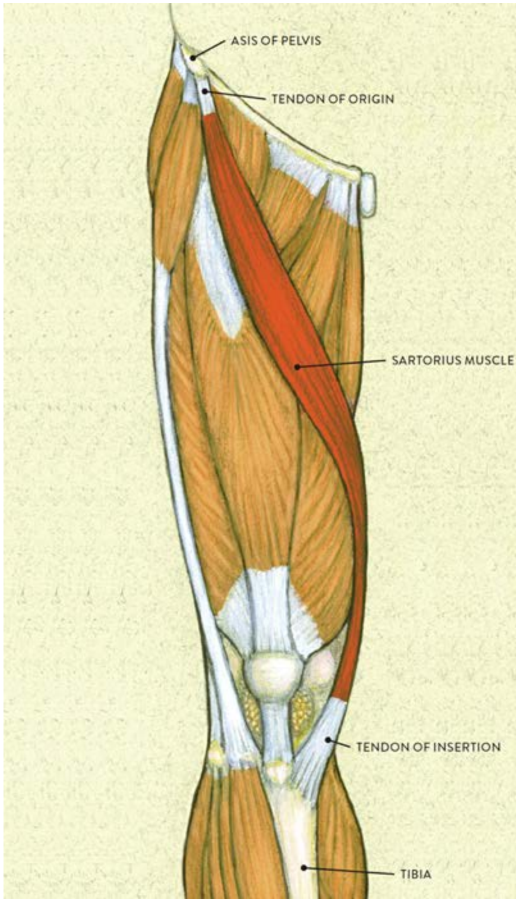
Contraction can be explained, somewhat simplistically, like this: When the sarcomere units receive a signal (an electrical impulse) from the central nervous system, the actin and myosin filaments slide along each other, an action referred to as the *sliding filament mechanism/theory.* This creates the dynamic force needed for the contraction of a muscle. When a muscle contracts, its fibers shorten toward the center of the muscle. This is called the *line of pull,* or *pulling force,* and when enough pulling force is exerted on the muscle attachments on bones, it lifts or pulls the bones, creating movement.

Muscle Attachments (Tendons)

In most cases, a muscle attaches to two different bones (though sometimes more), generating movement, called *joint action,* at the joint between the bones when it contracts. The places where the muscle attaches are called the *origin* and *insertion* sites, and these beginning and ending points are generally on different bones because if they were on the same bone, the muscle would simply lock in place when trying to contract. There are exceptions to this rule, particularly regarding the muscles of the face, but we'll deal with those separately.

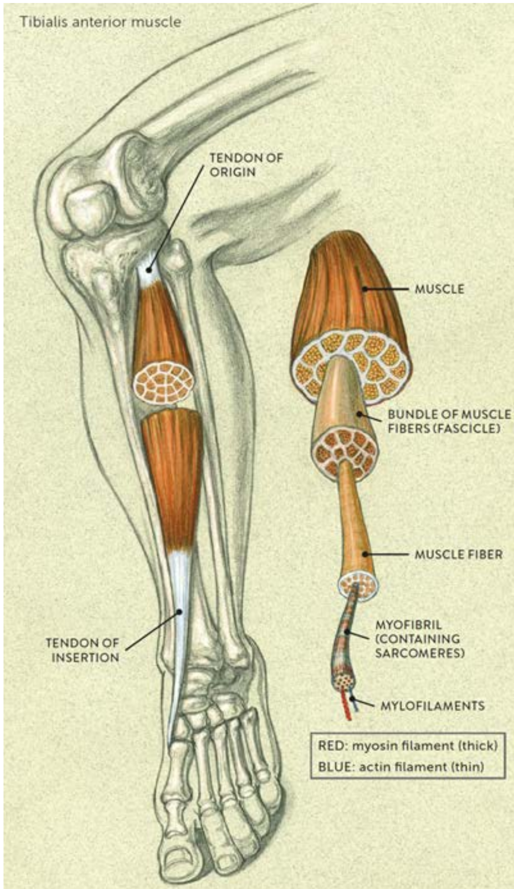
The muscles do *not* attach directly to bones; rather, the attachments are made via fibrous connective tissues called *muscle tendons.* The tendon at the muscle's origin site is called the *tendon of origin,* or *fixed attachment,* because the bone to which it attaches stays more or less stationary, or fixed, during movement. The tendon at the muscle's insertion site is referred to as the *tendon of insertion,* or *mobile attachment,* since it is connected to the bone that moves when the muscle is contracting. The following drawing, depicts the sartorius muscle of the upper leg, showing the tendon of origin on the upper end of the muscle and the tendon of insertion on the lower end.

ORIGIN AND INSERTION OF A MUSCLE



Right upper leg, anterior view

Patterns of skeletal muscle attachments are, however, somewhat varied: Some have multiple origins and a single insertion while others have a single origin and multiple insertions. In some cases, it is hard to decide which is the fixed attachment and which the mobile attachment because the muscle changes roles during various movements. Some anatomists have therefore abandoned the terms *origin* and *insertion,* replacing them with *proximal attachment* and *distal attachment,* which identify the attachments according to their placement on the body rather than their role in movement. In this book, however, I follow traditional practice, referring to muscle attachments as origins and insertions.



How much you want to learn about muscle attachments is up to you, but this knowledge can be advantageous for an artist. Medical illustrators and forensic artists of course need to know the locations of attachments for superficial- and deep-layer muscles, but any artist whose intention is to create realistic (as oppose to stylized) figures, who draws from memory, or who works with figural movement will also find this information beneficial, because without this awareness, the muscular forms might appear inaccurate or possibly distorted. When certain tendons become prominent, then a fairly accurate depiction of how these tendons connect to bone is essential for the overall dynamics of that particular region of the body. An example is the tendon of insertion of the sternocleidomastoid (sternal portion) as it inserts into the upper part of the sternum; this tendon projects quite strongly when the head is rotated. If the tendon is erroneously

placed in the wrong location, it might cause that part of the figure to look peculiar.

Any depiction of muscle attachments, including those presented here, should be used as an *approximate* reference. Human beings are physically diverse, and through many dissections anatomists have found that there are slight variations in the locations of muscle attachments. So figurative artists should know approximately where the two (or more) ends of a muscle attach rather than worrying about the attachments' precise location.

As I alluded to earlier, most facial muscles work differently from the skeletal muscles of the rest of the body. Except for the muscles controlling the mandible (lower jaw), facial muscles do not move any bones when their fibers contract because, aside from the mandible, the cranium consists of fused bones. Instead, they move soft-tissue forms, creating facial expressions. Similarities and differences between skeletal and facial muscle attachments are summarized in the following table.

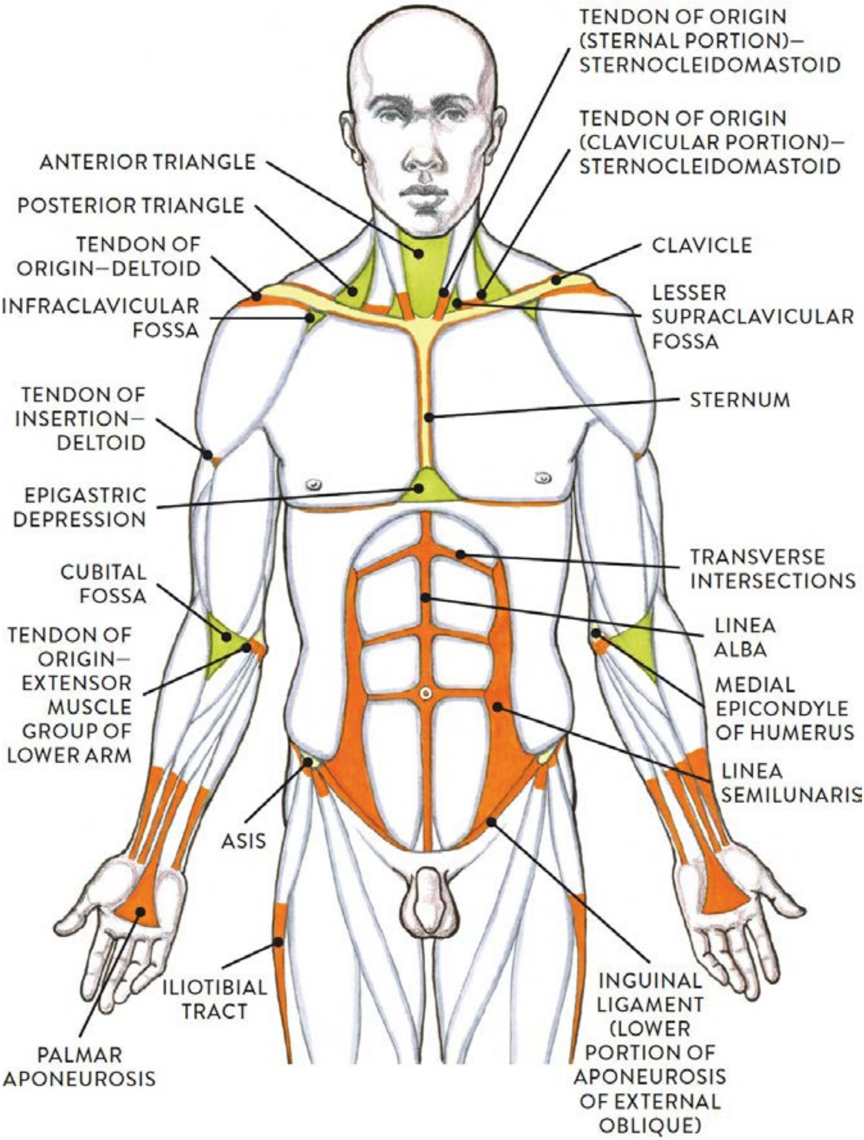
Skeletal versus Facial Muscle Attachments

SKELETAL MUSCLES	FACIAL MUSCLES
Origin: Muscle attaches to a bone with a tendon.	***Origin:*** Muscle attaches to a bone with a tendon.
Insertion: Same muscle attaches to a *different* bone with a *different* tendon.	***Insertion:*** Same muscle attaches into a *soft-tissue structure* such as skin, fascia, subcutaneous tissue, or another facial muscle.
Action: When the muscle contracts, the second bone moves.	***Action:*** When the muscle contracts, the soft-tissue region moves, possibly creating facial movement.

Tendon Landmarks

Tendons come in a variety of shapes, including cordlike forms, flat wide sheaths, and thin flat strips. Although the subcutaneous layer of adipose (fatty) tissue obscures many tendons, a few that are shaped like elongated cords do make occasional appearances on the surface form. This generally occurs when a tendon's muscle is contracting, pulling the tendon close to the skin. Indicating these tendons in figural studies can create a sense of dynamic tension, but the trick is to avoid making the tendons too obvious. For example, when depicting a series of tendons, such as those appearing on the dorsal (back) side of the hand, treat each one slightly differently: One or two can be prominent, the others lightly suggested; otherwise, they might look like stiff spaghetti strands glued on the hand.

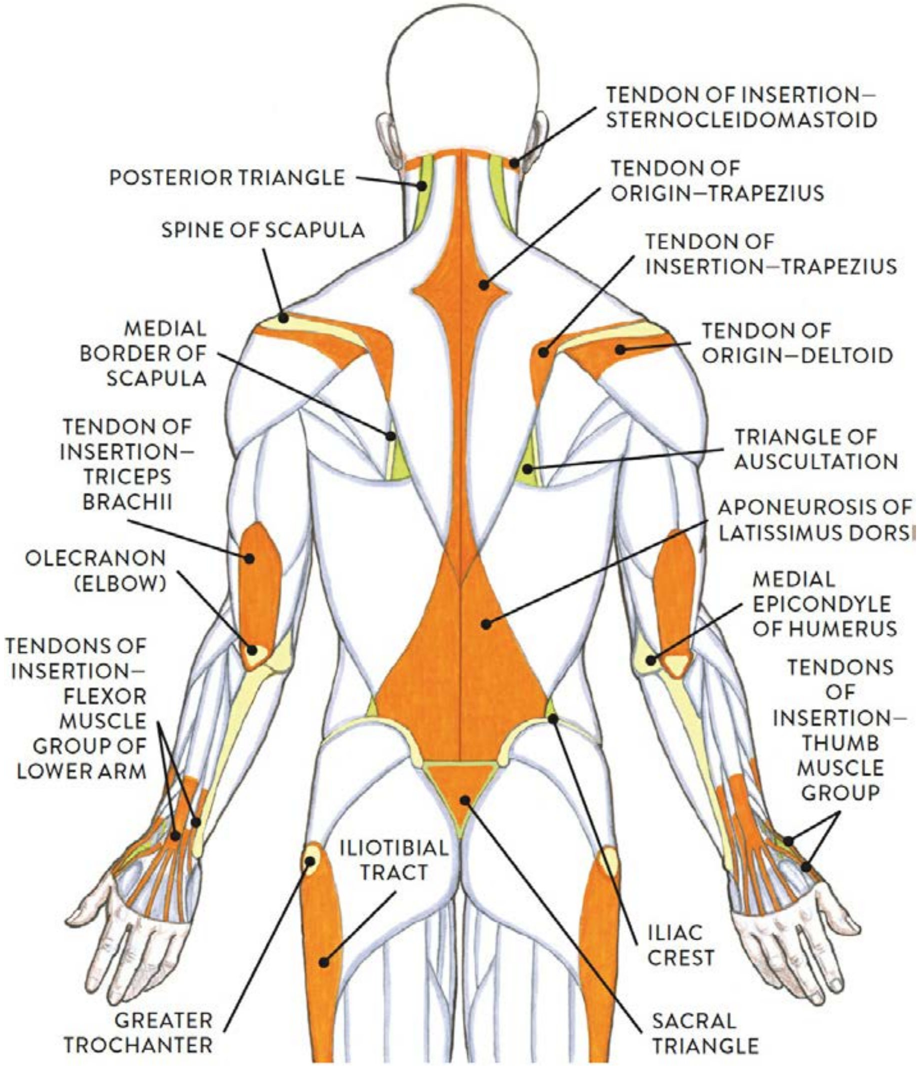
Cordlike fibrous structures are generally known as tendons, but broad flat sheathings of fibrous material are identified as *aponeuroses* (sing., *aponeurosis*). These wider sheets, which cover larger areas for muscle attachment, can be seen, for example, in the latissimus dorsi and external oblique muscles of the torso and abdominal regions. The following three drawings entitled *Tendons and Aponeuroses—Surface Form Landmarks,* depict the front torso and arms, back torso and arms, and three views of the legs, showing the basic locations of the tendons of the main superficial muscles. Key bony landmarks and triangular surface-form characteristics are also shown.



Torso and arms, anterior view

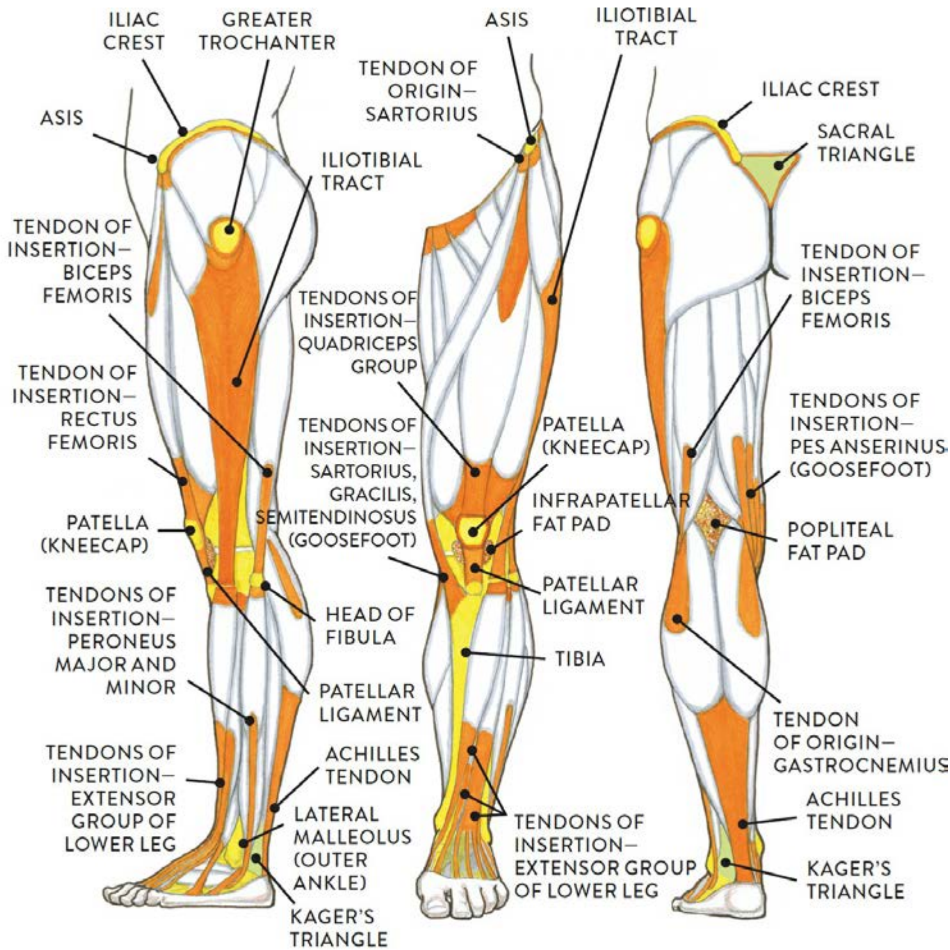
ORANGE: Tendons and aponeuroses
GREEN: Triangular depressions and projections on surface form
YELLOW: Bony landmarks

TENDONS AND APONEUROSES—SURFACE FORM LANDMARKS



Torso and arms, posterior view

ORANGE: Tendons and aponeuroses
GREEN: Triangular depressions and projections on surface form
YELLOW: Bony landmarks



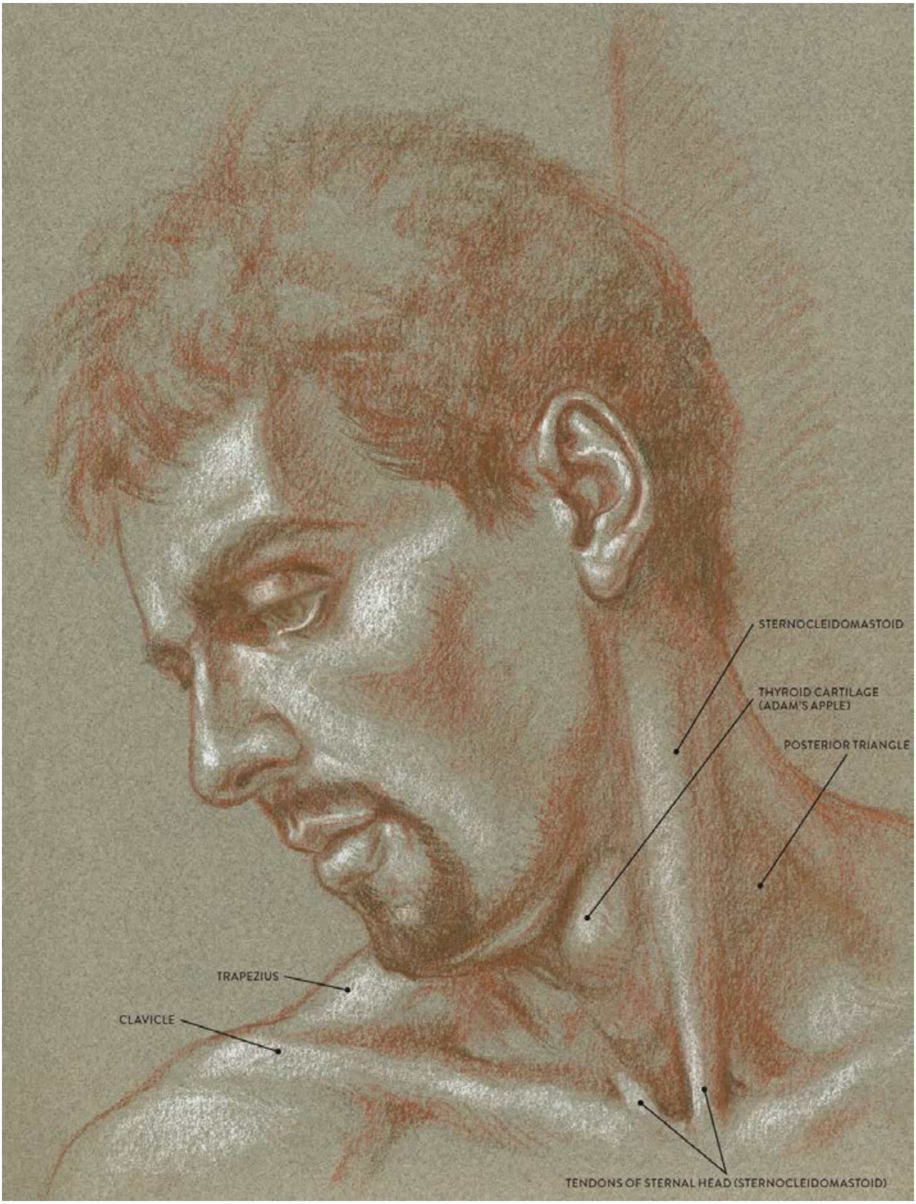
Upper and lower leg, three views

ORANGE: Tendons and aponeuroses
GREEN: Triangular depressions and projections on surface form
YELLOW: Bony landmarks

Tendons of the Sternocleidomastoid Muscle of the Neck

Tendons from each of the sternal portions of the sternocleidomastoid (SCM) muscle attach into the manubrium of the sternum. Between them is the suprasternal notch (pit of the neck). When the head turns sideways in a rotational movement, one of the tendons becomes quite prominent on the surface form, as can be seen in the following portrait study.

PORTRAIT STUDY OF CLAUDIO, WITH HEAD TURNED

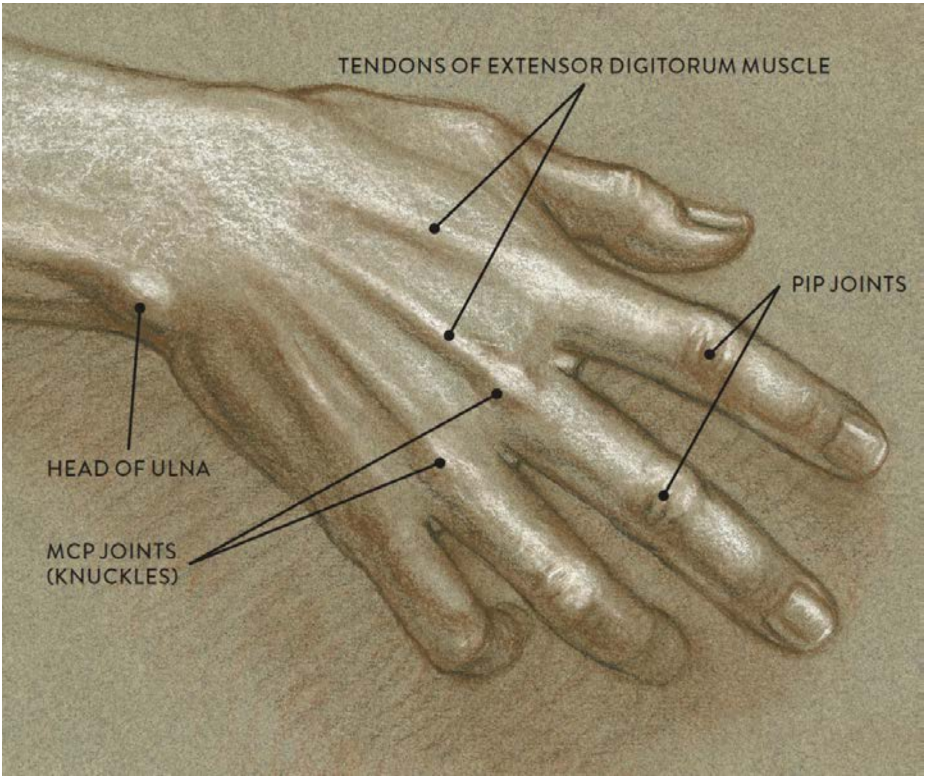


Sanguine and brown pastel pencils and white chalk on toned paper.

Tendons of the Dorsal Side of the Hand

The four tendons of the extensor digitorum muscle of the lower arm insert into the four fingers. They are most easily seen on the surface when the fingers are spread apart forcefully. Because the skin on the dorsal side (back) of the hand is very thin, these tendons sometimes appear, though subtly, when a hand is more relaxed, depending on the position of the hand and the way the light source is illuminating it. Again, when drawing a tendon, avoid emphasizing both sides of the tendon in heavy, dark lines, as this will give the tendon a flat look. One side should be emphasized in a soft, tonal line while the other side is indicated in a lighter value (or with white chalk if drawing on a toned paper surface) to achieve a more natural, organic look, as in the following life study. If there is tension in the tendons, then by all means accentuate them—but be careful not to overdo it.

STUDY OF A HAND, SHOWING TENDONS

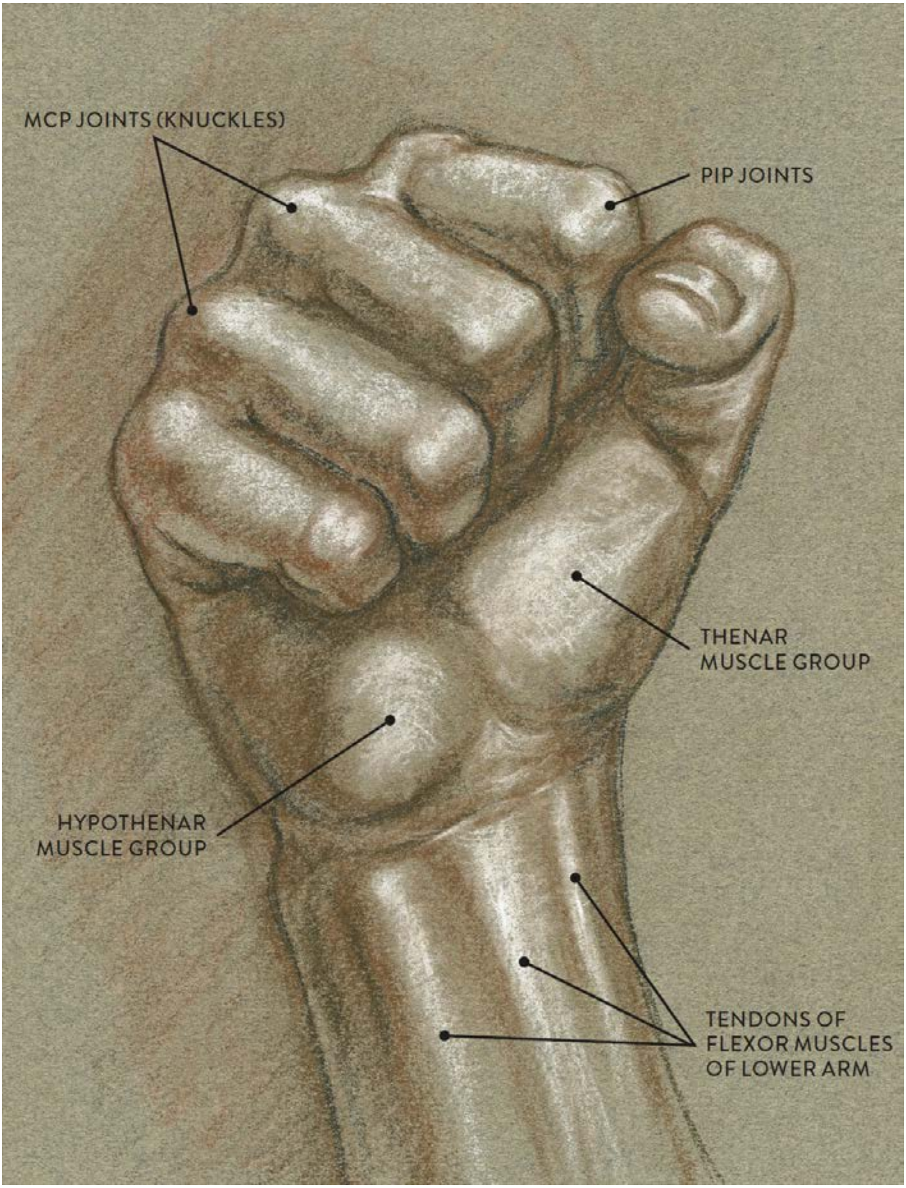


Sanguine and brown pastel pencils, charcoal, and white chalk on toned paper.

Tendons of the Anterior Region of the Lower Arm

The tendons of the various flexor muscles of the lower arm are usually seen on the surface when the hand clenches in a fist, as shown in the following life study. When the hand relaxes, the tendons become harder to detect.

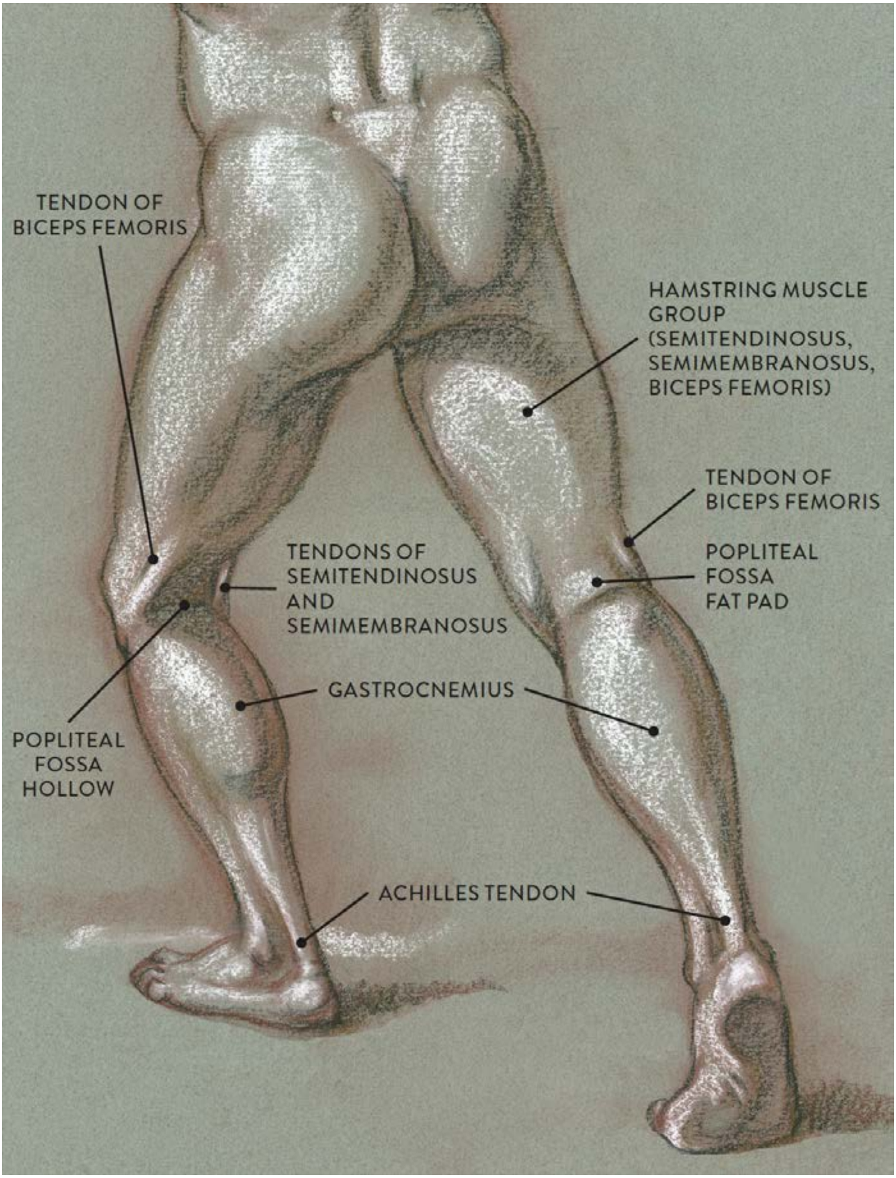
STUDY OF A TIGHTLY CLENCHED FIST



Sanguine and brown pastel pencils, charcoal, and white chalk on toned paper.

Tendons of the Hamstring Muscles

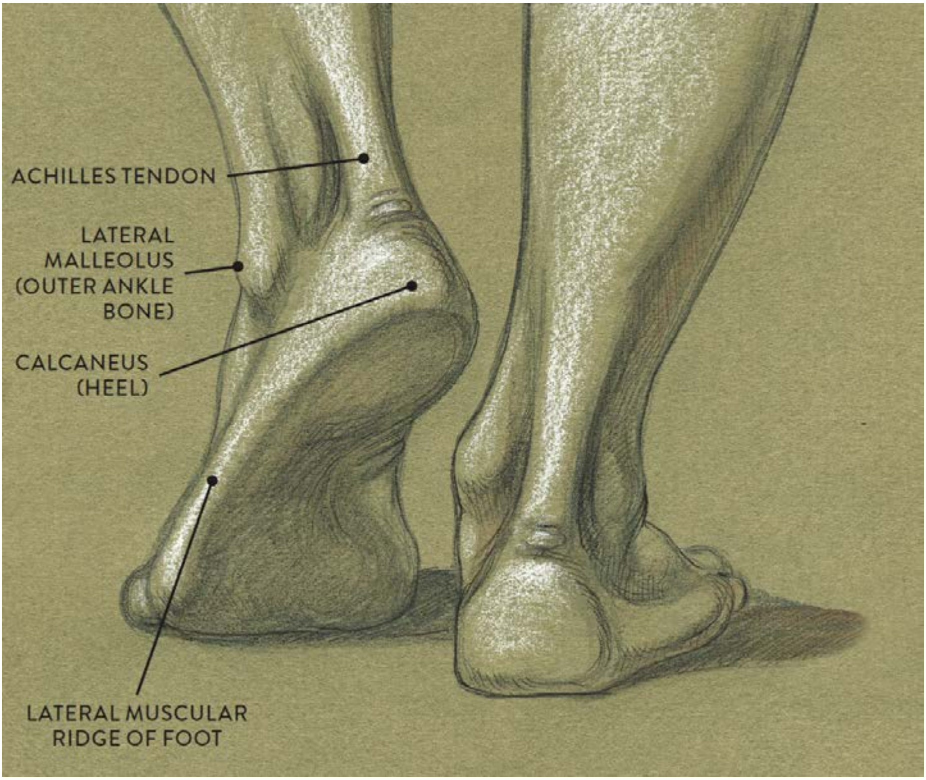
The tendons of the hamstring muscles attach on both sides of the popliteal fossa, located on the back of the knee. When the knee bends, these tendons become much more visible on the surface, as can be seen in the bent left leg in the following life study. The tendon of the biceps femoris muscle becomes especially prominent. This muscle is located on the outer side of the upper leg, and its tendon attaches into the head of the fibula bone, which is positioned on the outer side of the lower leg.



Charcoal pencil, sanguine and brown pastel pencils, and white chalk on toned paper.

The Achilles Tendon

The Achilles tendon—named for the warrior of Greek mythology who was killed by an arrow shot into his heel—is the tendon of the gastrocnemius and soleus muscles of the lower leg. It inserts into the heel bone (calcaneus) and appears on the surface form, sometimes quite prominently, as a thick, ropelike structure. The Achilles tendons are clearly visible in the following life study.



Graphite pencil, ballpoint pen, colored pencil, and white chalk on toned paper.

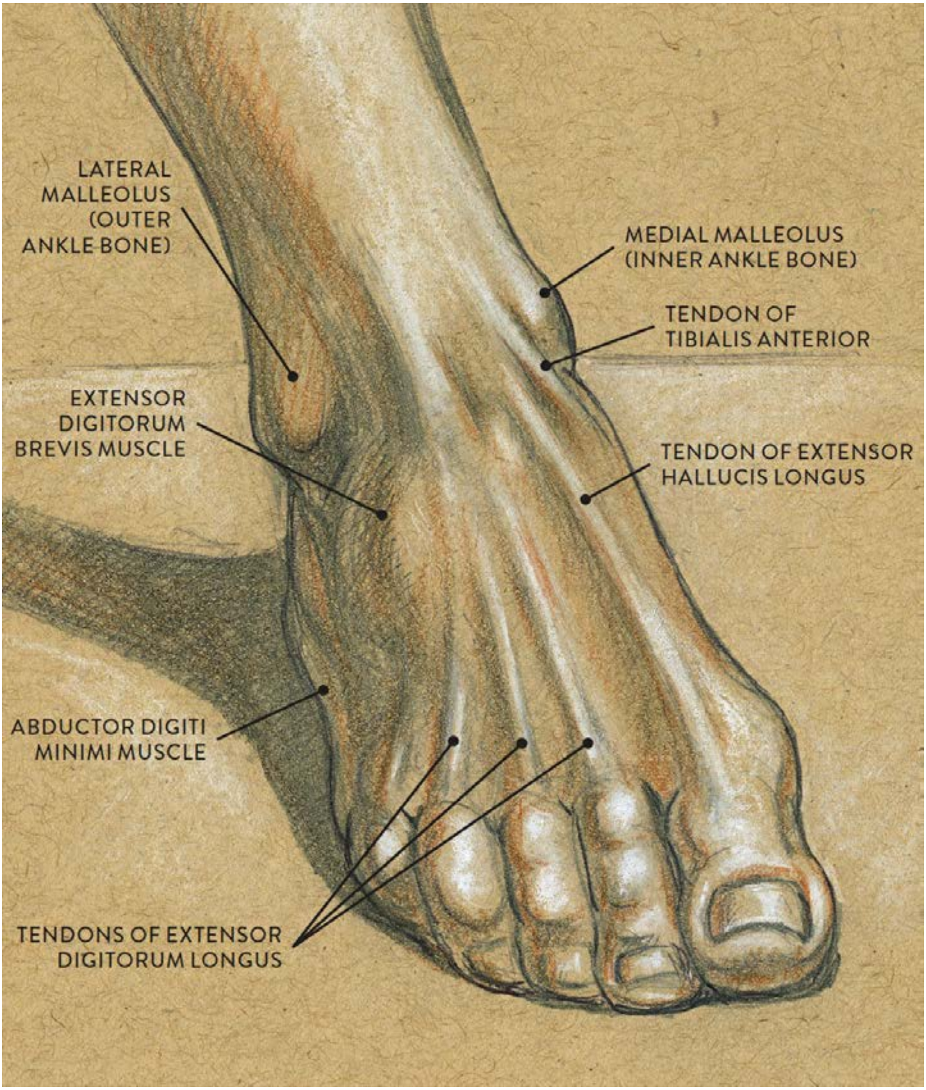
Tendons of the Dorsal Side of the Foot

The four tendons of the extensor digitorum longus muscle of the lower leg attach into each of the four lesser toes. When the toes are spread apart in a forceful manner, these tendons become very obvious on the surface form. A slender but prominent tendon from the extensor hallucis longus (long extender of the great toe) inserts directly into the great toe. This tendon becomes particularly noticeable when the large toe points upward.

A ropelike tendon on the lower part of the tibialis anterior muscle (shin muscle) of the lower leg can be seen only when the foot is in certain positions. Many artists confuse this muscle with the great toe's tendon and draw a continuous line from the tibialis anterior muscle directly into the great toe. This is fine for gesture studies, but in more detailed renderings you should try to distinguish the subtle separation between the two tendons near the ankle. In the life study below, I've slightly exaggerated the tendons to show their

placement on the surface more clearly.

STUDY OF A FOOT



Graphite pencil, colored pencil, and white chalk on toned paper.

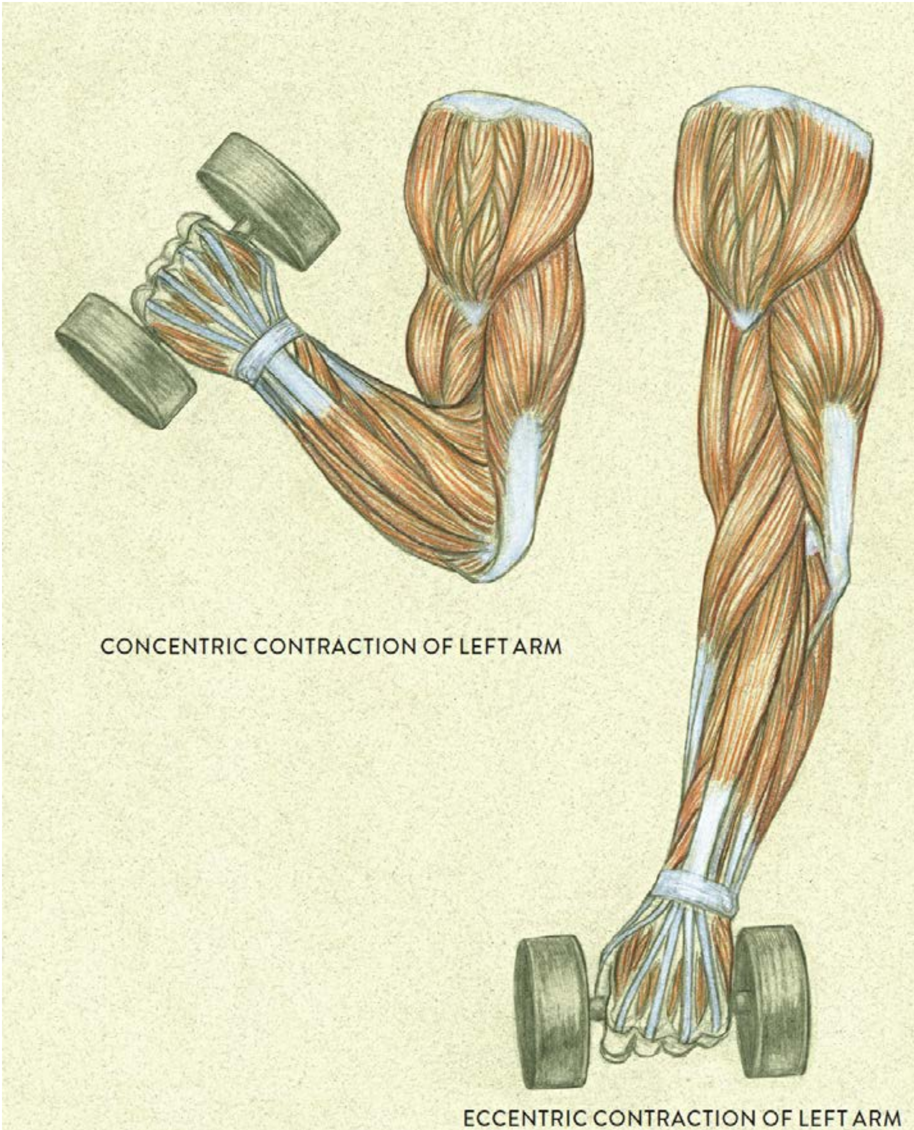
Muscle Contraction

Muscle contraction is also known as *muscle action* or *muscle tension.* Muscles can shorten their muscle fibers, lengthen them from a contracted state, or stabilize them at the same length. All these actions produce tension within the muscle fibers. When a muscle is not in any state of contraction, it is said to be relaxed, or in a “resting state.”

Muscle contractions can activate movement (initiating joint action), control the tempo of a movement (accelerating or slowing down joint action), or prevent unwanted movement by stabilizing a joint. The two basic categories of muscle contraction are called dynamic (isotonic) and static (isometric). Let’s look at each.

Dynamic Muscle Contraction

When a muscle changes length during a specific movement, either shortening its muscle fibers or lengthening them, this action is known as *dynamic muscle contraction,* or as *isotonic contraction, dynamic muscle tension,* or *dynamic movement.* There are two different types of dynamic muscle contraction: *concentric* and *eccentric.* Basically, concentric contractions shorten the muscle fibers and eccentric contractions lengthen them. For many years, these opposing actions were commonly referred to as *squash and stretch* in the animation industry, but there are other names for the actions, including *stretching and compressing* and *extension and contraction.*



Concentric and eccentric contractions

When a muscle is in a state of concentric contraction, the muscle fibers shorten toward their centers, and, in the process, pull a bone in a certain direction, causing movement at a joint. This type of action usually occurs in the "up phase" of a movement, as when

lifting a barbell.

When a muscle is in a state of eccentric contraction, the muscle fibers lengthen from the contracted state and the muscle is returned to its resting length. This type of action usually occurs in the "down phase" of a movement, as when lowering a barbell.

Don't confuse eccentric contraction with the state of rest, however. During eccentric contraction, the muscle fibers lengthen from a contracted state *in a controlled manner,* slowing down the movement against the influence of gravity. This smoothing out of a movement is known as the "braking force." For example, when lifting a weight, the biceps brachii and brachialis muscles shorten their fibers (concentric contraction) to lift the forearm and hand holding the weight in an upward direction (the up phase). Then, when the weight is being lowered (the down phase), the biceps and brachialis lengthen their muscle fibers but in a controlled way that resists gravity and thus prevents the forearm from slamming down. Even though the muscle fibers are lengthening, there is tension within the muscle. The drawings on this page illustrate concentric/eccentric phases of dynamic muscle contraction.

When depicting any active or semi-active pose, you should try to locate any muscles that are in a state of compression or stretching. Visual clues include

- compact shape of a muscle
- one muscle pressing against another muscle
- stretched muscles
- a tendon protruding close to the surface due to tension within its muscle

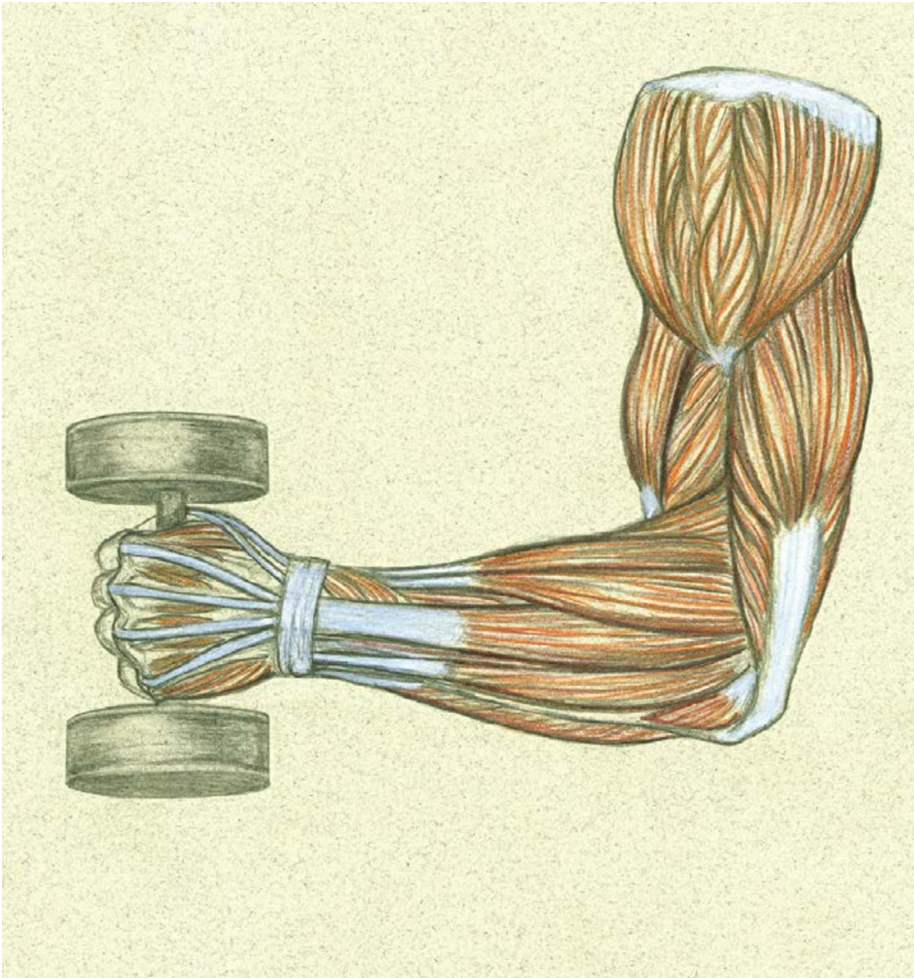
I made the study at right from the ancient marble sculpture called *Laocoön and His Sons* (or *The Laocoön Group*), housed in the Vatican Museum, which depicts a man and his two sons writhing in agony as they are attacked by serpents. The focus of my study is the central figure, whose anguished, twisting action exemplifies the energetic dynamics of stretching and compression. I always recommend drawing directly from figurative sculpture, whether ancient or contemporary, whenever possible. The three-dimensional anatomical forms of stone or bronze statues appear so much more clearly than they do in photographs of sculptures. Plus, you can usually walk around the sculpture and draw it from different viewpoints.

Sanguine and brown pastel pencils and white chalk on toned paper.

Static Muscle Contraction

In *static contraction*—also called *isometric contraction*—a muscle increases tension within its muscle fibers but does not change its length, thereby remaining stationary. No movement occurs at any joint, and in fact, this type of contraction stops movement altogether. Static contraction prepares muscles for possible action, as when a sprinter adopts a stationary position before taking off in a race. It is essential for maintaining posture (otherwise, gravitational forces would pull us down) and is activated when

holding heavy objects stationary, as shown in next drawing. It also occurs when a muscle needs to stabilize a joint when movement is not wanted.



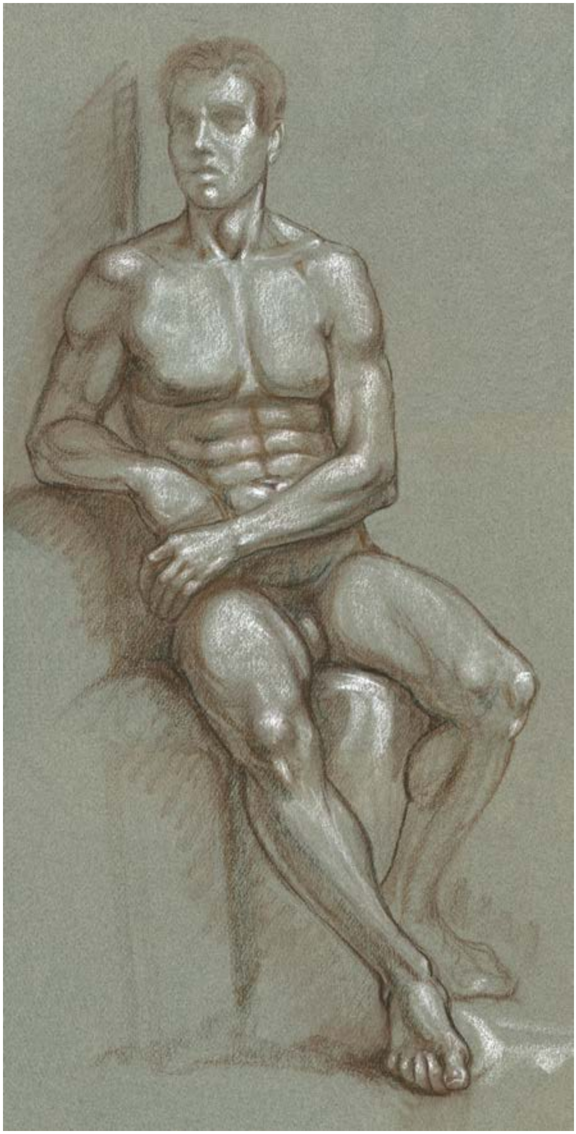
STATIC CONTRACTION OF LEFT ARM HOLDING WEIGHT STATIONARY

Left arm, lateral view

No matter how relaxed a person may look when standing or sitting, his or her muscles are still contracting to some degree to maintain the position and to prevent the person from being pulled down by gravity. Artist's models have to maintain each pose for a length of time without moving or shifting their weight, so their bodies are always in a state of static contraction while posing. They can usually hold difficult action poses for a short time, but for longer poses they need to make sure their weight is balanced. The

mark of a good model is being able to do a long pose and make it look interesting—dynamic or lyrical, not symmetrical or stiff—and to hold that pose (usually for a twenty-minute interval) without moving or twitching. In interpreting the pose, the artist will try to convey the tension or relaxation of the various anatomical forms, as I did in the following life study.

STUDY OF A MUSCULAR MALE FIGURE SITTING



Colored pastel pencil, charcoal pencil, and white chalk on toned paper.

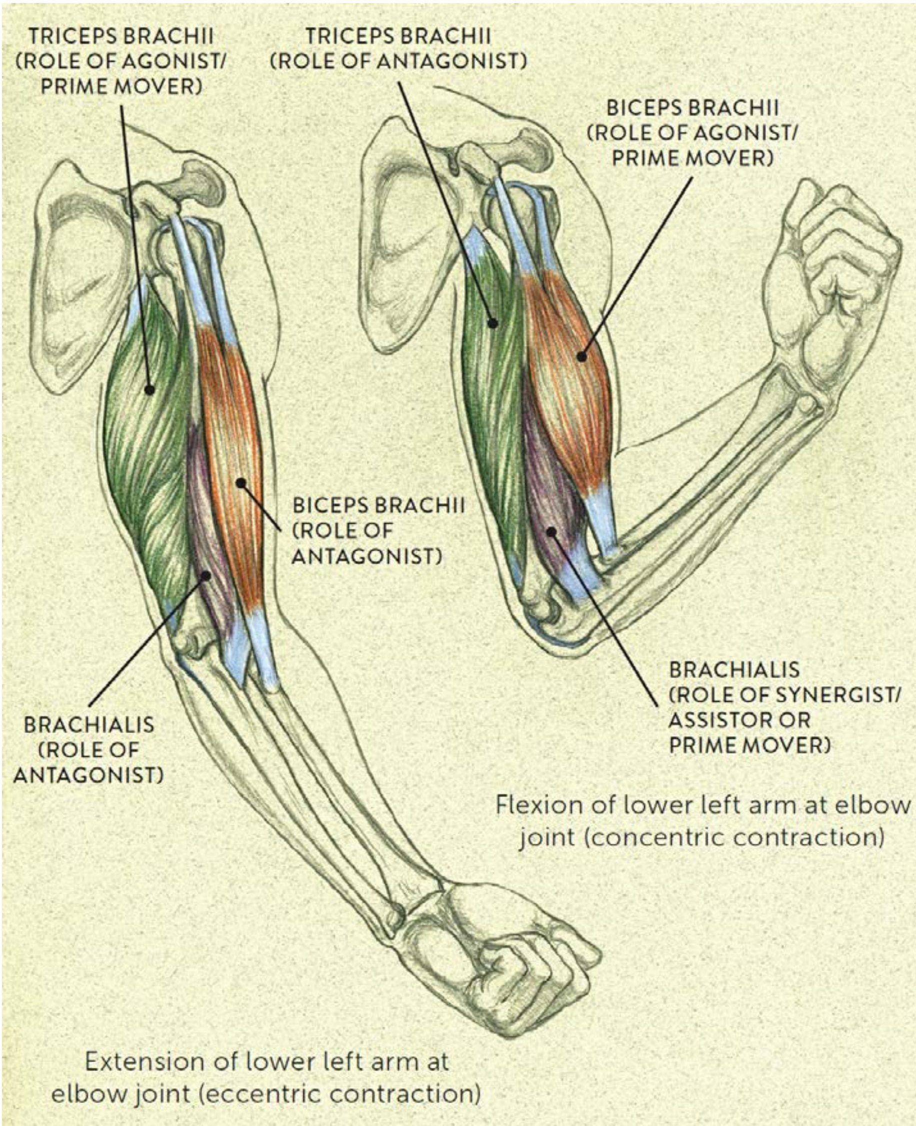
Muscles’ Differing Roles

When a particular movement occurs at a joint, several muscles in the vicinity of the joint participate. Although the main function of every muscle is to contract its muscle fibers, a muscle can play different roles at different times during a movement or series of movements. Generally speaking, there are four different roles muscles can play: agonist (prime mover), antagonist, synergist (assistor), and stabilizer (fixator).

Agonist (Prime Mover) and Antagonist

The muscle that is mainly responsible for activating a bone or body part for a specified movement is known as the *agonist,* or *prime mover*. When the agonist muscle contracts, it becomes a more compact version of itself. As this action is occurring, another muscle —the *antagonist*—has to act in opposition. This muscle, usually positioned on the side of the bone or body part opposite from the agonist, has to stretch its muscle fibers to yield to the agonist muscle’s contraction. This relationship can be clearly seen in the flexion and extension of the lower arm at the elbow joint, shown in the following drawing.

AGONIST (PRIME MOVER) AND ANTAGONIST MUSCLES



Upper and lower left arm, anterior view of scapula with arm moving sideways of torso

What happens is this: When the biceps brachii (located on the anterior portion of the upper arm) contracts its muscle fibers, it lifts up the lower arm, becoming a bulging shape. In this action, the biceps brachii is considered the agonist or prime mover (with

the brachialis and brachioradialis acting as synergists, or assistors). (Some experts think that the brachialis, along with the biceps, is also a prime mover when it lifts the lower arm.) The antagonist muscle in this action is the triceps brachii, which is positioned on the posterior region of the upper arm. While the biceps is contracting, the triceps stretches its muscle fibers so that the elbow joint and lower arm can move freely, without interference. When the forearm is lowered, the biceps and triceps reverse their actions, switching roles. The triceps, which now contracts its muscle fibers, becomes the prime mover in lowering the forearm, while the biceps is now the antagonist, stretching its muscle fibers. (If only the lower arm is being moved, the humerus and scapula bones remain stationary, with the shoulder joint stabilized by the rhomboids, the trapezius, and the rotator cuff muscles of the scapula.)

Synergists and Stabilizers

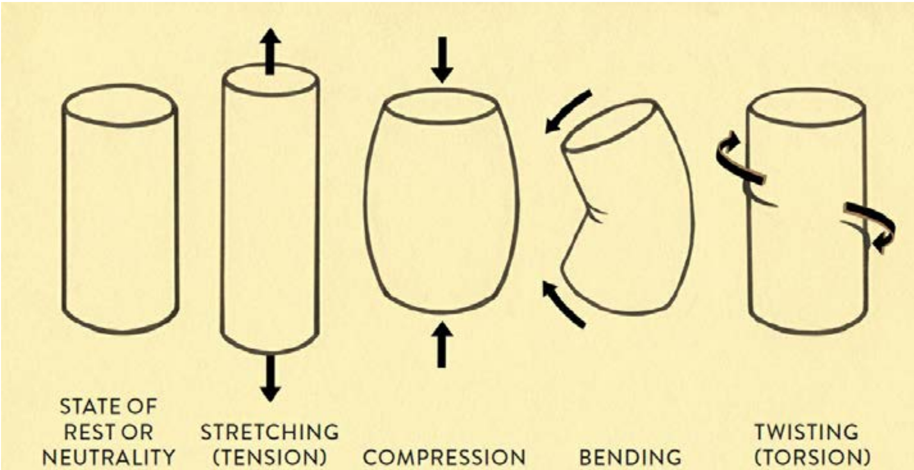
As mentioned, a muscle usually does not move a bone or other body structure all by itself; other muscles assist in the process. These *synergist muscles,* or *assistor muscles,* provide additional pull near the prime mover's tendon of insertion. They also help prevent any unwanted actions that could occur during a particular movement.

While a particular movement occurs, other muscles may act as *stabilizers,* or *fixators,* holding a bone firmly in place—usually the bone where the prime mover muscle originates. This prevents any unwanted movement from occurring so that the agonist and synergists can act more efficiently. When stabilizer muscles hold a bone stationary, their muscle fibers contract but do not shorten—the type of contraction called static or isometric contraction.

The Influence of Force on Anatomical Forms

The term *force* refers to energy that produces, modifies, or restrains movement of bodily components. There are two basic types: *internal force,* created within the body, and *external force,* produced outside the body. Internal force results from muscle contractions. When the nervous system sends a message to a muscle, telling it to contract, a tension is generated, creating movement at a joint. But it's not just the muscle and bone that are affected. Soft-tissue anatomical forms such as tendons, ligaments, the subcutaneous layer, and the skin are also influenced by internal force and may change shape in any of the following ways, also schematized in the following drawing:

- *Compression of forms,* which occurs during the contraction of a muscle, making it shorter or compressed, or when a form is pressing against an object
- *Stretching of forms,* or *tension,* which occurs when a muscle stretches or when forms are pulling in opposite directions
- *Bending of forms,* which occurs when two forms press against each other
- *Twisting or spiraling of forms,* also called *torsion* or *torque,* which usually occurs when one structure twists in one direction while another twists in a different direction



Black arrows indicate the direction of the force influencing the anatomical form.

Combinations of these actions (called *combined loading*) can also occur, as when a figure or bodily structure twists while bending or stretches while twisting. There are countless variations, depending on the type of action taking place. When you draw the figure in an active pose, you'll observe that many forms are influenced by the dynamics of force, and you can interpret that dynamism in your own unique way, infusing the forms and lines of the body with vitality and energy.

The gesture drawing called *Study of Male Figure in Dynamic Twisting Movement,* conveys the tremendous amount of energy the model is exhibiting in this pose. The twisting action at the waist region shows both tension and compression, and the swinging of the hair contributes to the figure's overall rhythm. The gesture drawing *Study of a Female Figure Bending,* shows the anatomical forms stretching and compressing throughout.

STUDY OF MALE FIGURE IN DYNAMIC TWISTING MOVEMENT

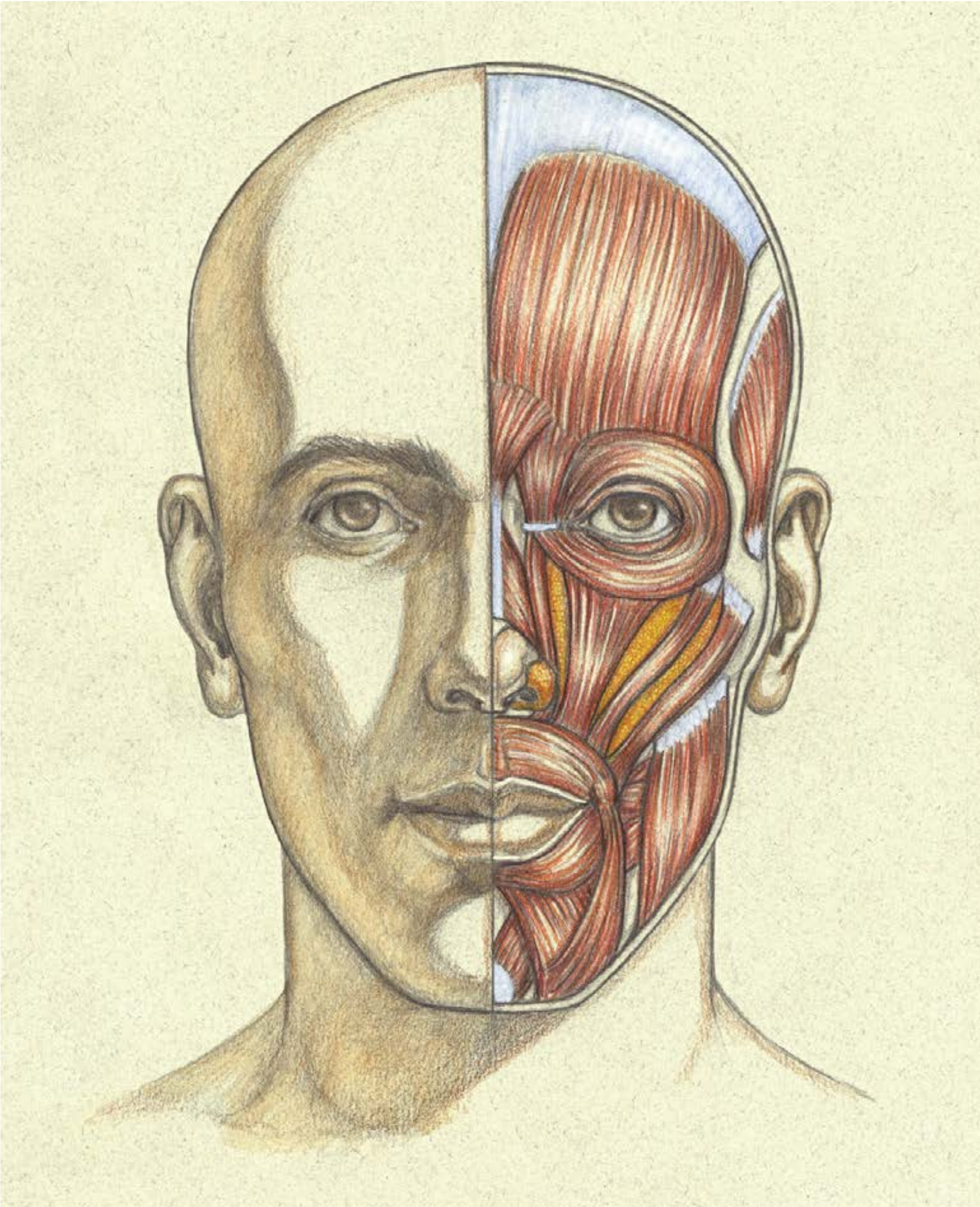
Black Conté crayon on newsprint.

Black and brown Conté crayon on newsprint.

Of the external forces affecting the body, gravity may be the most important, because it is always at work, pulling everything—including human bodies—toward the center of the earth. Certain muscles contract without moving any joints (isometric contraction) to counter the force of gravity and help hold the body upright. But there are other external forces that can strongly affect the body, making it difficult to maintain equilibrium. These

include forces of nature (a turbulent wind or a large wave), physical impact with external objects, and combat with another body (wrestling, boxing).

When the body is performing an action requiring forceful exertion, such as pushing a heavy cart or lifting a heavy box, the external impact is channeled as tension, which is also created internally within the muscles. So external and internal forces can affect the human body simultaneously—and, in fact, they do so almost constantly. Illustrators, storyboard artists, comic book artists, and animators (traditional and digital) all depict figures in various forms of movement being affected by external and internal forces of every kind.



HEAD STUDY—HALF FACE/HALF MUSCLES

Graphite pencil and colored pencil on lightly toned paper.

Chapter 4

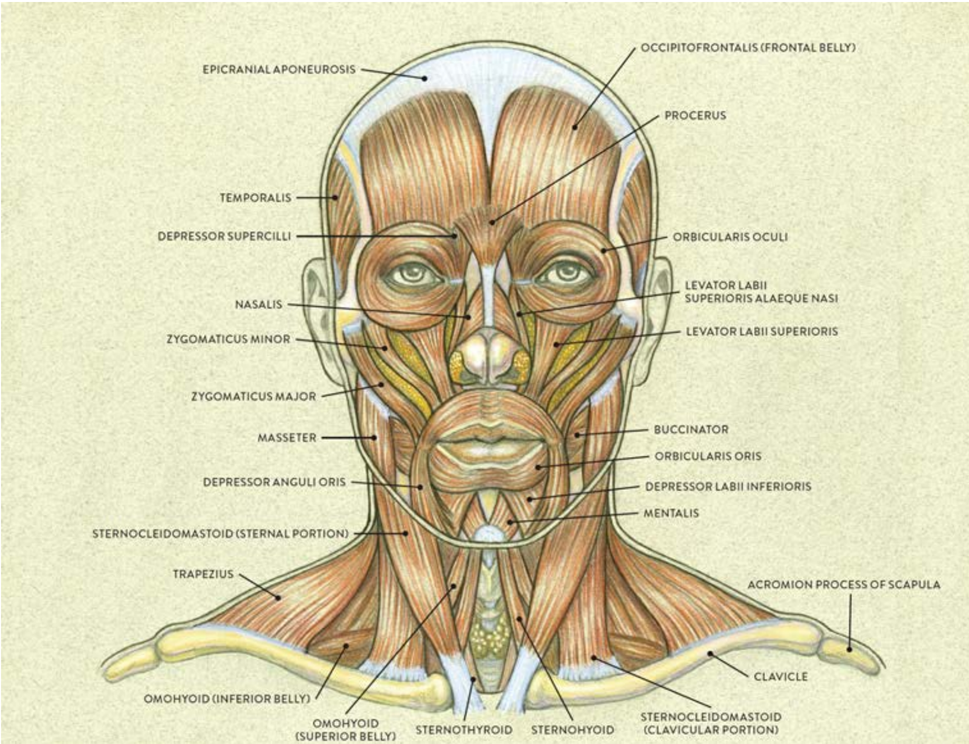
Facial Muscles and Expressions

When learning about muscles' influence on the surface form, the muscles of the face present the trickiest problem. This is because the various circular and straplike facial muscles are completely covered by a layer of subcutaneous tissue that usually obscures any evidence of their presence beneath the skin. This means you must approach your understanding of facial anatomy in a holistic way. Knowing approximately where the muscles attach on the cranium is helpful, but it is only one part of the picture. Bone structure, facial planes, facial features, and the overall three-dimensionality of the head and face are likewise important, as are elements such as the shape of the hair, the fleshiness (or lack thereof) of the face, wrinkles (if present), and the attitude, or psychology, that the face projects. Attitude can be conveyed by the way a head is held, the quality of the eyes, a slight hint of emotion playing across the facial features, and other subtle factors.

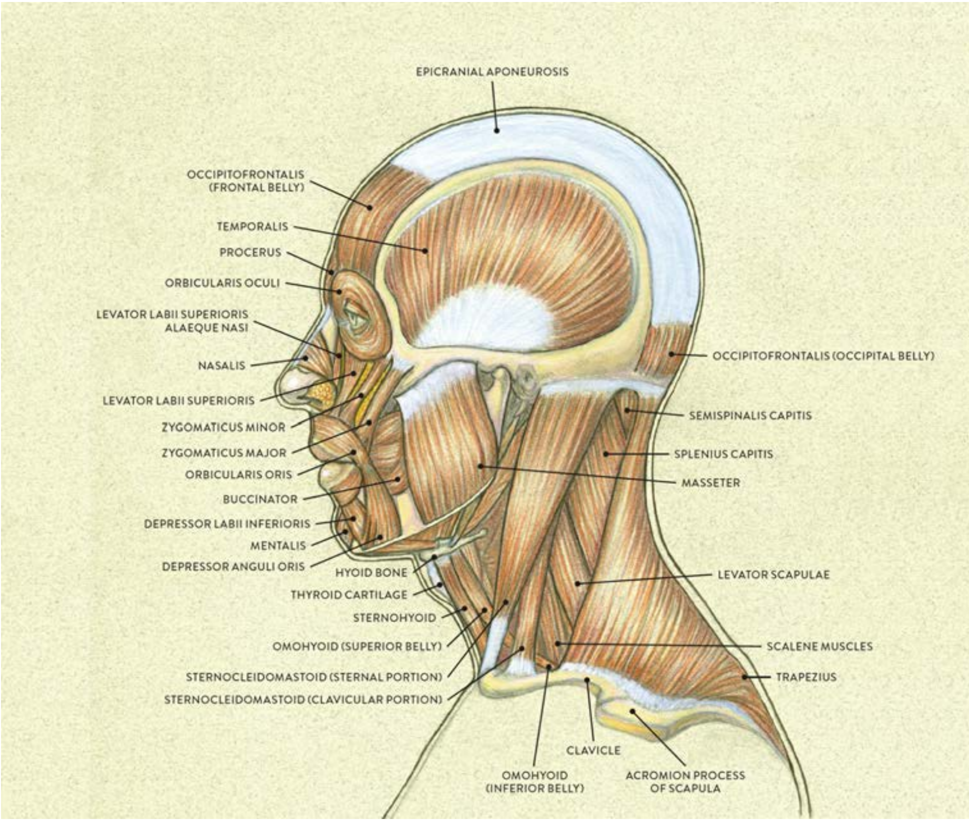
So why learn about the placement of facial muscles at all? The answer is that understanding facial muscles is key to understanding the movements of the face, better known as *facial expressions.* The study of facial muscles and their movements is essential for animators, storyboard artists, comic book artists, illustrators, and fine artists who want to achieve a sense of narrative and expressiveness within their figurative work. Understanding muscle and soft-tissue placement is also important for forensic artists who reconstruct faces from skulls found at archaeological or crime sites, helping them create lifelike likenesses of people whose faces have vanished.

The first three drawings in this chapter depict the muscles of the face in the anterior, lateral, and three-quarter views.

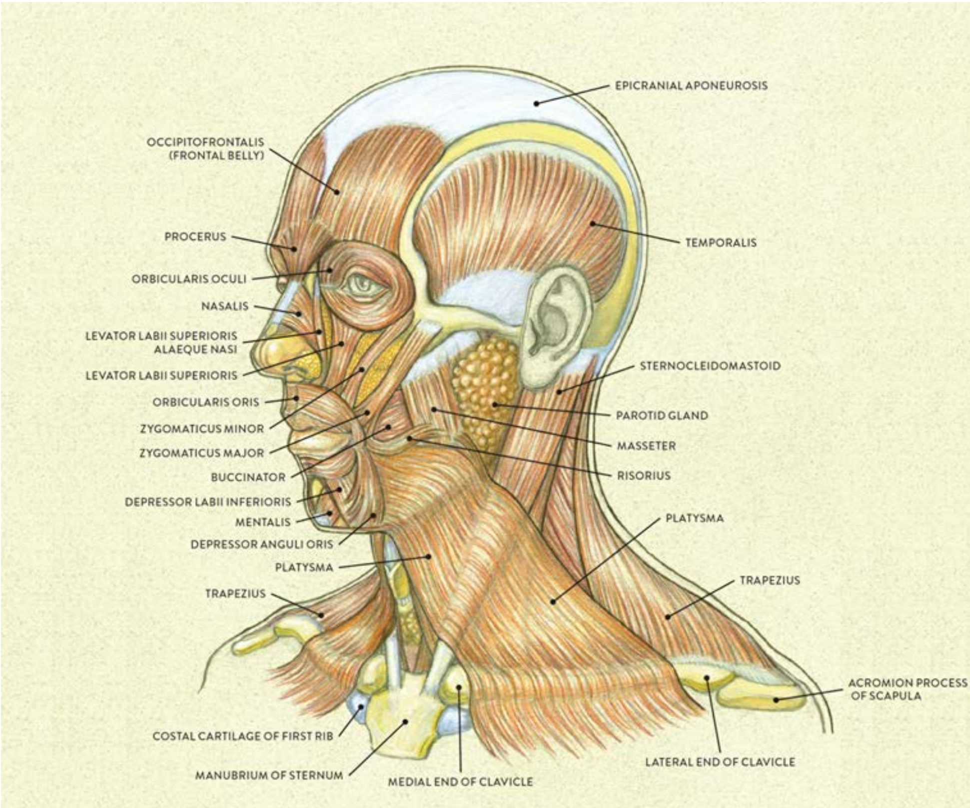
MUSCLES OF THE FACE—ANTERIOR VIEW



MUSCLES OF THE FACE—LATERAL VIEW



MUSCLES OF THE FACE, WITH PLATYSMA MUSCLE—THREE-QUARTER VIEW



Facial Muscle Movement

As discussed in the previous chapter, an individual skeletal muscle generally attaches on one bone (the site of origin) and then crosses over a joint to attach on a second bone (the site of insertion). When the muscle contracts, it pulls the second bone, creating movement. While this is an extremely simplified explanation, it does help you understand the general pattern of body movement. For the most part, however, this pattern does not apply to the facial region.

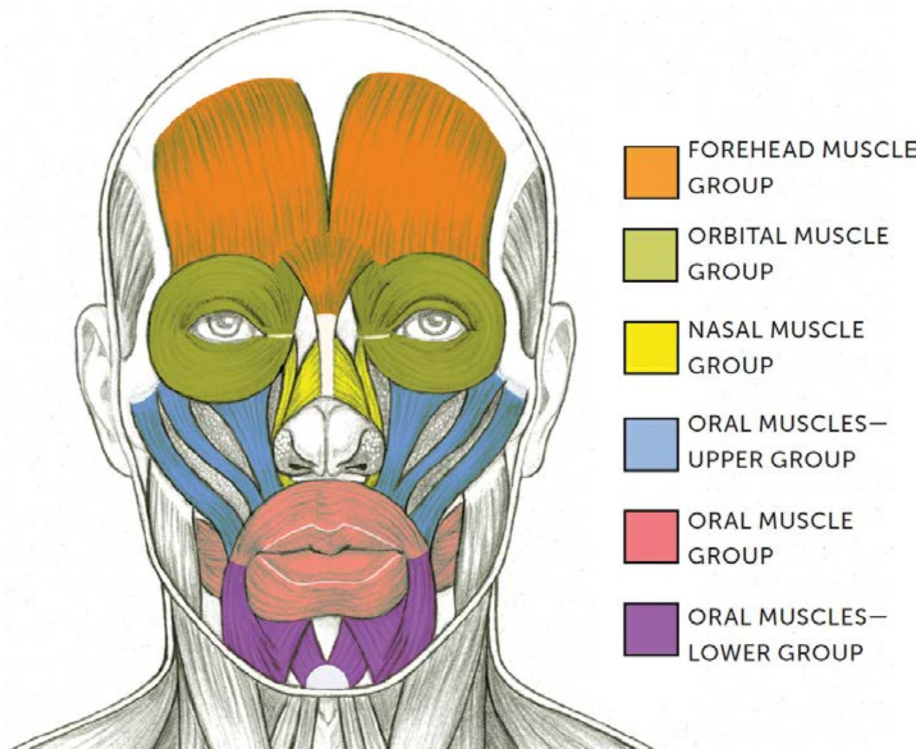
The anterior portion of the skull, consisting of the *facial bones,* is the site of attachment for most facial muscles. Since the bones of the cranium are, with the exception of the mandible (jawbone), fused together, these bones cannot move when facial muscles contract. Facial muscles do generally originate on bone, like the skeletal muscles of the rest of the body, but instead of inserting on a different bone, they insert on soft-tissue structures. So when muscles of the face contract, they do not pull bones but rather the various soft forms of the face (eyebrows, eyelids, lips, skin), creating facial movements, or expressions.

Skin creases called *expressive lines,* or *dynamic lines,* typically occur in the vicinity of a facial expression. For example, when the muscle of the forehead (frontalis) contracts, it lifts the eyebrows upward, producing a series of horizontal creases on the forehead. On young people's faces, the creases in the skin disappear when the muscles relax, but as people age many of these expressive lines become *static lines,* or *permanent wrinkles,* etched into the skin. When an older person makes a particular facial expression and then relaxes his or her face, the wrinkles—worry lines, laugh lines, crow's feet, frown lines—remain present on the surface of the skin.

Facial Muscle Groups

In what follows, I group the facial muscles according to the region of the face that they influence most significantly: the forehead muscle group, the orbital muscle group (of the eye region), the nasal muscle group, and the oral muscle group. The muscles that lift the upper lip (oral muscles—upper group) and those that depress the lower lip (oral muscles—lower group) are dealt with separately. The locations of these muscle groups are shown in the following drawing.

FACIAL MUSCLE GROUPS



I will also be introducing the muscles of the jaw and one muscle of the neck, the platysma, that is importantly involved in facial expressions.

Names of Facial Muscles

The names of facial muscles provide clues to their location, function, or size. Knowing the meanings of these terms helps you avoid confusing one facial muscle with another, similarly named muscle:

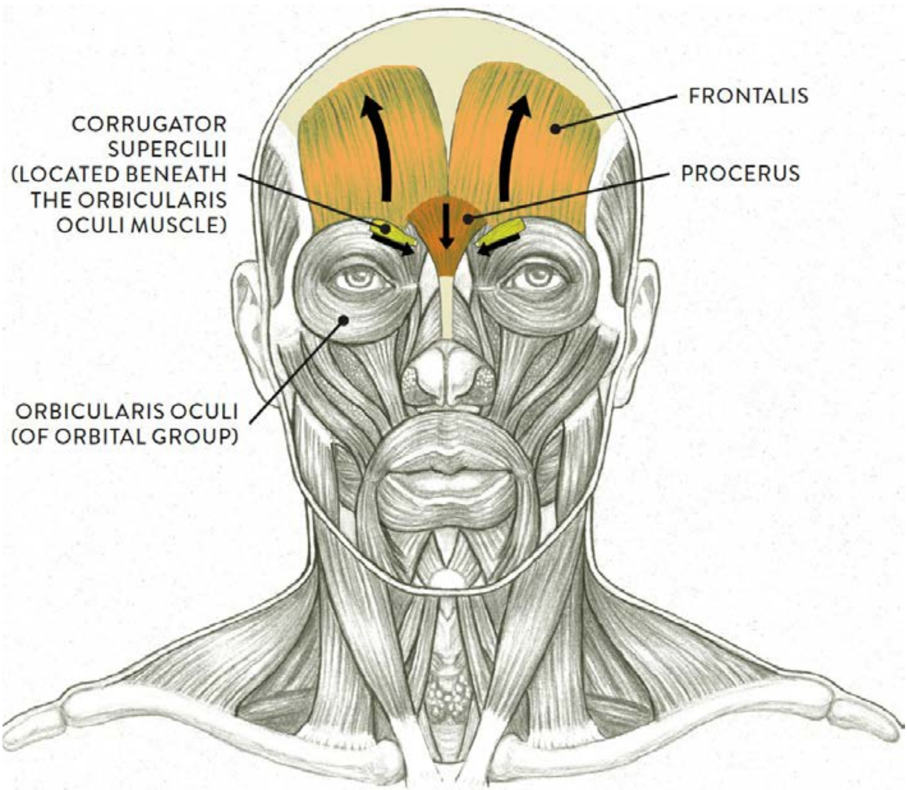
- *Labii* pertains to the lips.
- *Nasalis* and *nasi* pertain to the nose.
- *Orbicularis* pertains to a circular or orblike form.
- *Oculi* pertains to the eye.
- *Oris* pertains to the mouth.
- *Supercilii* means “above the eyebrow.”

- *Inferioris* means “below,” or “lower.”
- *Superioris* means “above,” or “upper.”
- *Levator* indicates that a body part is moved in an upward direction.
- *Depressor* indicates that a body part is moved in a downward direction.
- *Major* means “greater.”
- *Minor* means “lesser.”

The Forehead Muscle Group

The *forehead muscle group,* located on the frontal bone of the cranium, consists of the frontalis, procerus, and corrugator supercilii muscles. These are the muscles that move the eyebrows and the skin of the forehead. Muscles of the forehead group and their associated expressions are shown in the following drawings.

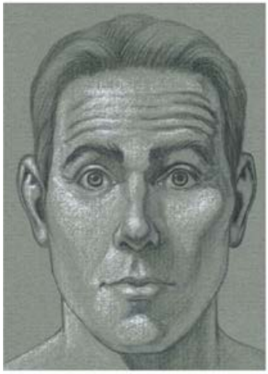
FOREHEAD MUSCLE GROUP



Arrows indicate direction of muscular contraction.

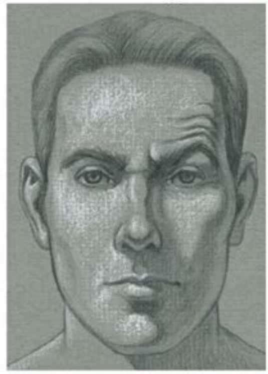
FOREHEAD MUSCLE GROUP—FOUR STUDIES

Frontalis muscle, both sides contracting



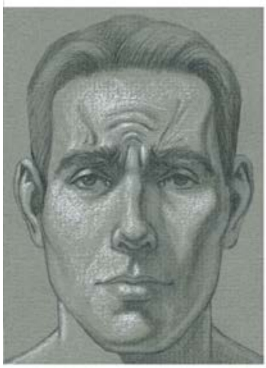
Eyebrows are elevated upward.

Frontalis muscle, one side contracting



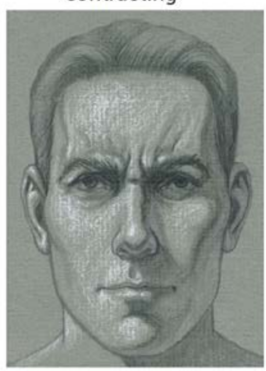
One eyebrow is elevated while the other remains neutral.

Frontalis muscle, inner portion contracting



Inner eyebrows are elevated.

Procerus and corrugator supercilii muscles, both muscles contracting



Inner eyebrows are depressed.

The *frontalis* (pron., frun-TAY-liss or frun-TAL-iss) is a thin muscle occupying the forehead region of the cranium. It is divided into two sections, one on either side of the midline of the head. It is actually the frontal portion (or belly) of the *occipitofrontalis* muscle, which has a large, thin aponeurosis (the *epicranial aponeurosis*) that wraps tightly over the top of the cranium, like a skullcap; the occipital belly of this muscle is at the back of the cranium. The origin of the frontalis is near the hairline on the frontal bone. The frontalis inserts into the skin and subcutaneous tissue of the forehead near the eyebrows. The fibers of this muscle also interweave somewhat with the fibers of the orbicularis oculi and procerus muscles.

When the frontalis as a whole contracts, it lifts both eyebrows, producing a series of horizontal wrinkles across the forehead region. This action occurs in expressions of surprise, disbelief, and curiosity as well as in a silent acknowledgment of recognition.

When only one side of the frontalis contracts, it lifts one eyebrow while the other remains more or less stationary. Over the lifted eyebrow, a series of wrinkles curve on top of each other, like ripples. This action occurs in expressions of bemusement, amused distrust, or skepticism.

When just the inner portion of the frontalis contracts, with the rest of the muscle remaining in a normal state, it lifts the inner ends of the eyebrows, producing vertical and curving horizontal wrinkles in the central portion of the forehead. It can also create a curved horseshoe wrinkle above the root of the nose. This action occurs in expressions of sadness, sorrow, grief, and worry.

The *corrugator supercilii* (pron., KOR-uh-GATE- or soo-per-SIL-ee-eye or KOR-ah-gay-tor soo-per-SIL-lee-ee) are two small muscles, each positioned at an slight angle beneath the orbicularis oculi muscle of the orbital group (see this page). Its origin is on the inner end of the brow ridge of the frontal bone, and it inserts into the forehead skin over the middle of the eyebrow.

When the corrugator supercilii contracts, it lowers the inner ends of the eyebrows, producing skin wrinkles in a vertical direction on the forehead near the root of the nose. This expression is associated with anger, and these creases are called *vertical glabellar furrows* or *frown lines*. Other expressions include intense concentration, concern, disapproval, annoyance, and a state of confusion. The corrugator supercilii works in tandem with the procerus muscle in the expression commonly called “knitting the eyebrows.” On some faces you can see the bulging shape of the corrugator supercilii muscle when it is contracting.

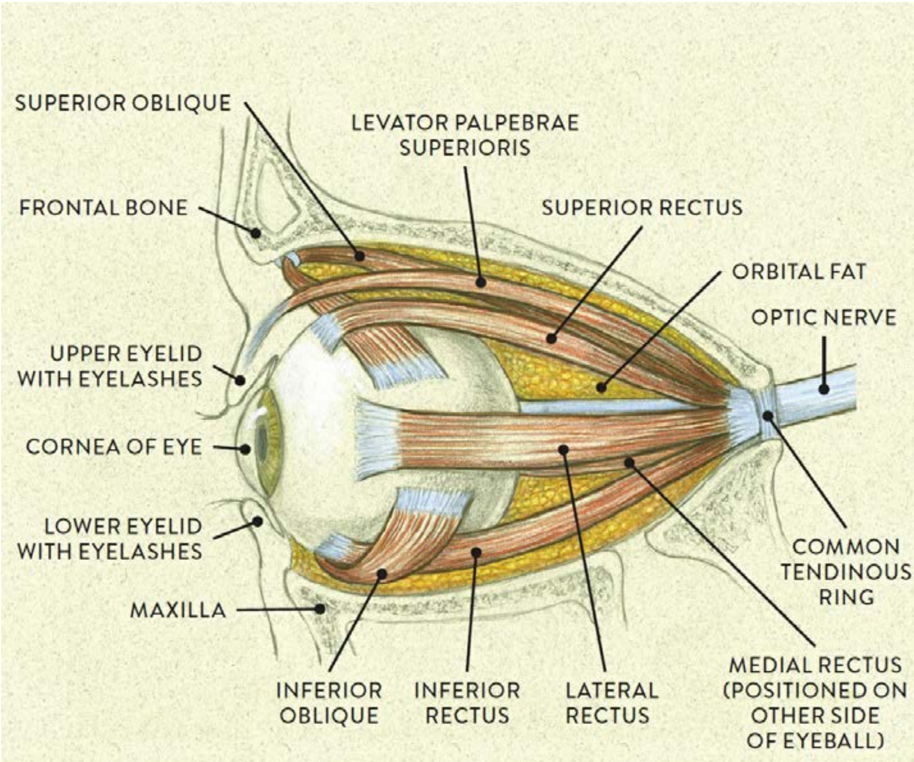
The *procerus* (pron., pro-SAIR-us, pro-SEE-rus, or pro-SIR-us) is a small fan-shaped muscle positioned in the lower central region of the forehead. Its origin is on the bridge of the nose (the nasal bone and upper portion of the lateral nasal cartilage) and fascia, and it inserts into the skin of the lower region of the forehead between the eyebrows.

When the procerus contracts, it depresses the inner ends of the eyebrows, producing a horizontal skin crease at the root of the nose. It can also produce a vertical skin wrinkle on the inner end of each eyebrow. This muscle, along with the two corrugator supercilii muscles and the two depressor supercilii muscles of the orbital group (see this page), produces a frowning action of the eyebrows. It is activated in expressions of anger, disdain, disapproval, annoyance, and intense concentration.

The Orbital Muscle Group

The ball of the eye is positioned within its eye socket (*orbital cavity*) in a cushion of

orbital fat. The orbital muscle group includes the orbicularis oculi and depressor supercilii muscles, which participate in moving the eyelids and portions of the eyebrows (see this page). Additionally, there are several elongated strips of muscle called the *extrinsic eye muscles,* or *extra-ocular muscles,* that originate at the back of the orbital cavity and other locations within the eye socket and that insert on the ball of the eye. These muscles, shown in the drawing below, move the eye in various directions, causing it to directly look up (elevation), directly look down (depression), and look to the left and right (abduction and adduction). They also assist in moving the eye to look upward medially or laterally, and to look downward medially or laterally. None of the extrinsic muscles can be seen on the surface, but I include them here because of their essential role in eye movement.



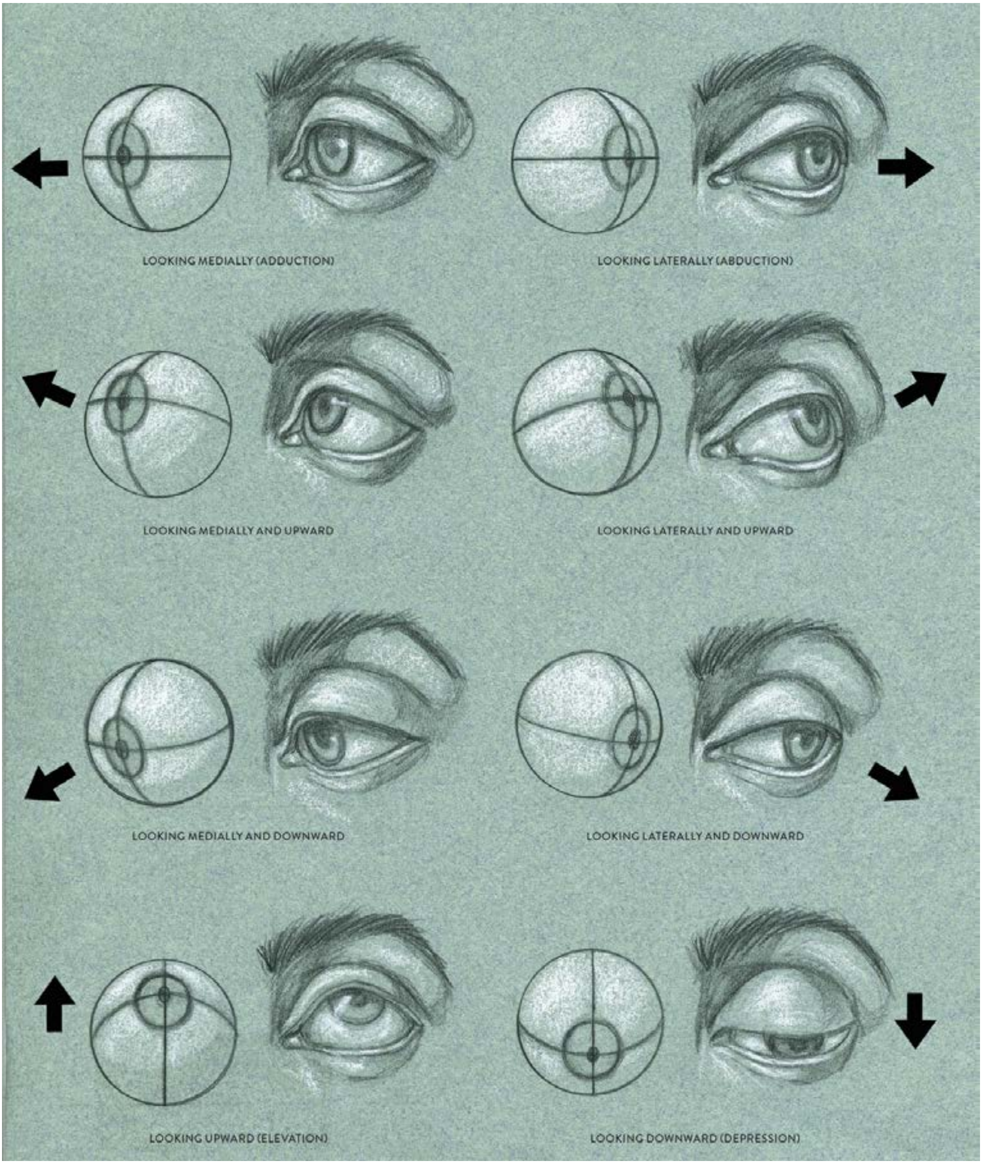
Left eye, lateral view

One of the extrinsic eye muscles moves the upper eyelid but does not participate in moving the eyeball. This is the *levator palpebrae superioris* (LEV-uh-tor PAL-pa-bree soo-PEER-ee-or-iss), a small, slender muscle in the orbital cavity that attaches directly into the skin of the upper eyelid rather than on the eyeball. While it is the orbicularis oculi muscle (see this page) that closes or squeezes the upper lid, the levator palpebrae superioris is responsible for lifting the upper lid in an exaggerated manner—the action colloquially known as the "deer in the headlights" stare or the "bug-eyed" look. The full contraction of the muscle reveals the white of the eye above the upper lid and can be seen in expressions of terror, shock, and astonishment. More moderate contractions cause an intense stare or look of surprise or disbelief. This muscle is not seen on the surface form.

The drawing *Movement of the Eyeball,* shows the movement capability of the eyeball enabled by the extrinsic eye muscles. The placement of the iris, which is the round

colored disk of the eyeball, immediately tells us the direction the eyes are looking in.

MOVEMENT OF THE EYEBALL



Left eye, anterior view

Becoming aware of the placement and shape of the iris on the ball of the eye will help you portray the eyes more convincingly. If the eyes are looking straight ahead, the iris is

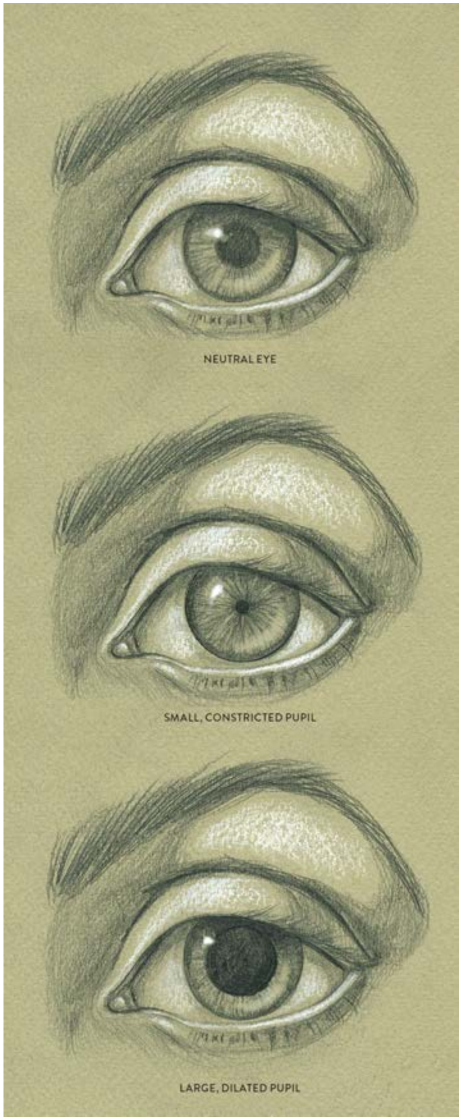
a full circle, but partly overlapped by the upper lid. When the eyes look directly upward or downward, the iris retains its circular shape, but even more of it is covered by the eyelids. When the eyes look off to either side, the iris becomes an ellipse overlapped by the eyelids.

The Muscles of the Iris

When the facial muscles surrounding the eye region are activated, the eyes can communicate a variety of expressions. But even in an otherwise neutral face with no contraction of facial muscles, the eyes still have the potential of conveying expression or emotion. This is possible because of the dilation and constriction of the *pupil* in the center of the *iris*. The iris is a circular disk whose color varies among people, ranging from deep browns to hazel, green, and various shades of gray and blue. Light enters the eye through the pupil, and the iris contains two muscles that expand and contract the pupil, allowing more or less light to pass through. These muscles, which are classified as smooth muscles (not skeletal muscles), are the *circular muscle of the iris* and the *radial muscle of the iris*. When the circular muscle contracts, it reduces the size of the pupil; when the radial muscle contracts, it dilates the pupil. These muscles cannot contract at the same time.

The size of the pupils can itself convey emotion. For instance, if you depict the pupils as tiny black pin-size holes, the eyes will have extremely intense or even creepy look. Overly enlarged pupils can produce the dreamy, romantic “doe-eyed” look sometimes called “bedroom eyes.” The drawing *Constriction and Dilation of the Pupil,* shows three views of the left eye, each with a different size pupil. The dilation or constriction of the pupils can also work in concert with the contraction of facial muscles in the region of the eye to produce expressions. For example, if the eyebrows are lifted high, the upper lid is drooping, and the pupils are overly enlarged, the face will look sleepy or intoxicated. When the eyebrows are depressed downward and the pupils are black small holes, the facial expression can indicate rage.

CONSTRICTION AND DILATION OF THE PUPIL



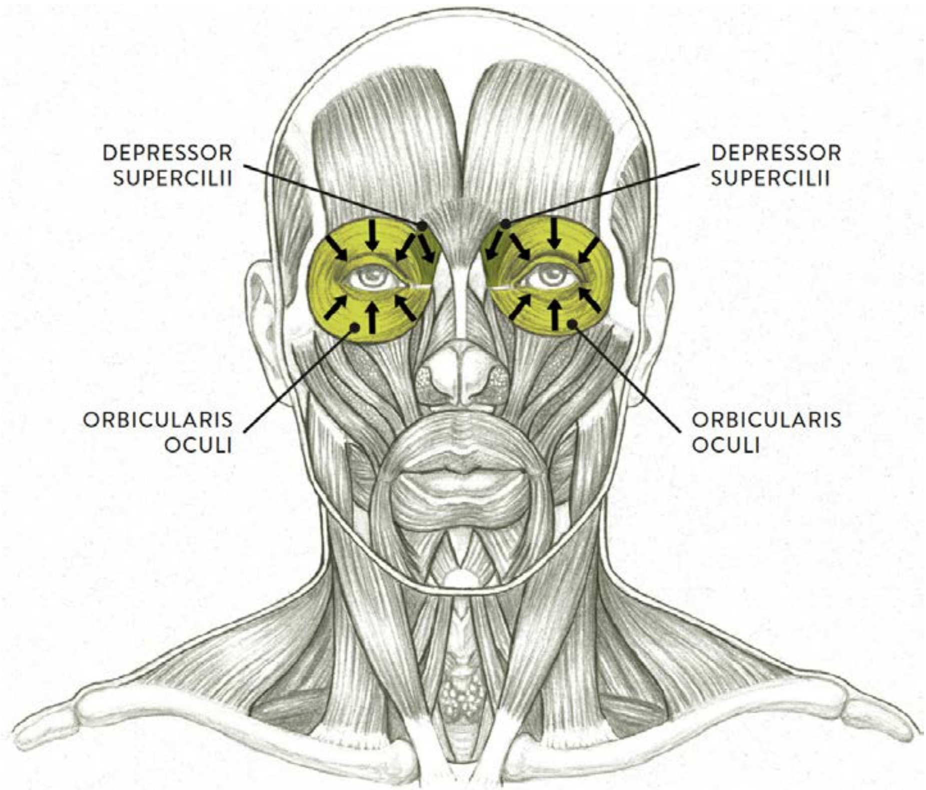
Left eye, anterior view showing different size pupils

Even highlights in the eye can indicate emotion. In expressions of positive emotions, the eyes can have a sparkling look, and placing a bright highlight in one eye can communicate joy, mirth, or amusement. (Downplay the highlight in the other eye to avoid giving the eyes a sentimental quality.) In expressions of despondency and melancholy,

the eyes lose their luster, so downplay or eliminate the highlights when trying to convey those moods. In expressions of grief and sorrow, tears may well up in the eyes, and these drops of fluid will have their own small highlights.

The Orbicularis Oculi and Depressor Supercilii

The orbicularis oculi and the depressor supercilii muscles are positioned on the front portion of the orbits (eye sockets), as shown in the next drawing. These muscles move the eyelids and participate in moving the eyebrows.



Arrows indicate direction of muscular contraction.

The *orbicularis oculi* (pron., or-BICK-yoo-LAR-iss OCK-yoo-lie or or-BICK-kyoo-LAIR-riss OCK-yoo-lee) is the circular muscle of the eye, positioned over the front portion of the orbit. Its basic shape is round or orblike, hence the name *orb*icularis. This muscle has two main sections: The outer section, called the *orbital portion,* surrounds the outer eye socket, while an inner portion, called the *palpebral portion*, lies within the eyelids.

When the inner (palpebral) portion of the orbicularis oculi contracts, it usually causes a subtle action, such as gently closing the eyelids. If the outer portion contracts with some intensity, then the lids are squeezed shut and a series of radiating skin creases—commonly called “crow’s feet”—appears at the outer corner of the eye. An even more intense contraction can create other skin creases near the root of the nose and below the lower eyelid. Depending on the degree of contraction, the orbicularis oculi also produces the actions of blinking, winking, and squinting.

Blinking is a very subtle action of the eyelids. Natural blinking is an involuntary movement of the lids (the “blink reflex”) that bathes the eyeball with fluid from the tear ducts, preventing it from drying out and clearing the eye of dust particles. While this eye movement may seem unimportant, blinking can make an animated figure seem far more natural and alive, especially when the character is not talking or showing any facial expression. Rapid, more intense blinking can also be seen in expressions of disbelief, bewilderment, and astonishment, or might indicate that a person is telling a fib. A “fluttering” of the upper lids is seen when someone is enamored or charmed.

Winking is a stronger, more intentional action than blinking. In winking, the lids of one eye are rapidly squeezed together (just once), while the other eye remains relaxed. This action can indicate that someone is “in the know” about a particular thing, but it can also be an affectionate gesture, much like throwing a small visual “kiss” to another person. In animated figures, these subtle actions can speak volumes in the absence of any dialogue.

Squinting occurs when the face is reacting to an external threat or force (wind, blinding light, physical impact) or when someone is experiencing an internal force of some intensity (sneezing, coughing, crying). More subtle squinting, in which the lower eyelid overlaps the lower portion of the iris, can be seen in expressions of skepticism, distrust, hatred, or disgust.

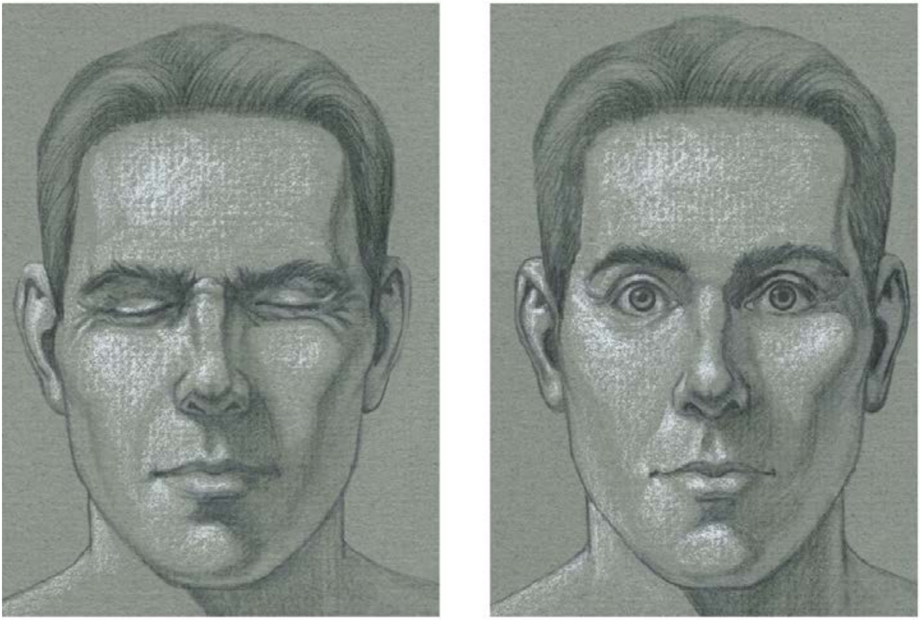
The *depressor supercilii* (pron., dee-PRESS- or soo-per-SIL-ee-eye or dee-PREH-sor soo-per-SIL-lee-ee) is actually part of the orbicularis oculi (although some anatomists consider it a separate muscle). Its fanlike fibers radiate upward from the inner portion of the orbicularis oculi near the root of the nose, interweaving with parts of the frontalis and procerus muscles of the forehead. When the depressor supercilii contracts, it assists the corrugator supercilii and procerus muscles in lowering the inner eyebrows, causing some minor skin creases on the side of the root of the nose.

The following studies shows how the eyelids move when certain orbital muscles contract on an otherwise neutral face.

ORBITAL MUSCLE GROUP—TWO STUDIES

Orbicularis oculi muscle, outer and inner portions compressing tightly together

Levator palpebrae superioris muscle, whole muscle contracting

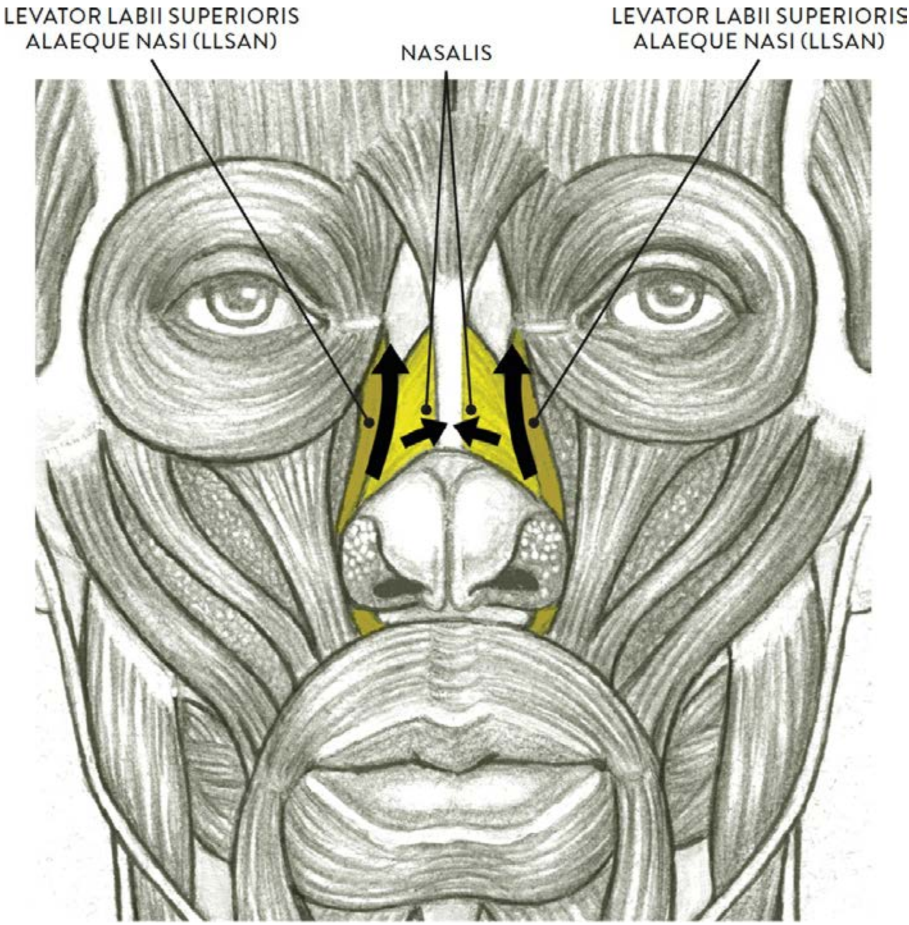


Eyelids are squeezed shut.

Upper eyelid is elevated.

The Nasal Muscle Group

The two main muscles of the nasal region are the nasalis and the levator labii superioris alaeque nasi, shown in the following drawing. The actions of these muscles are somewhat subtle, slightly moving the wings of the nose and skin around the nose.



Arrows indicate direction of muscular contraction.

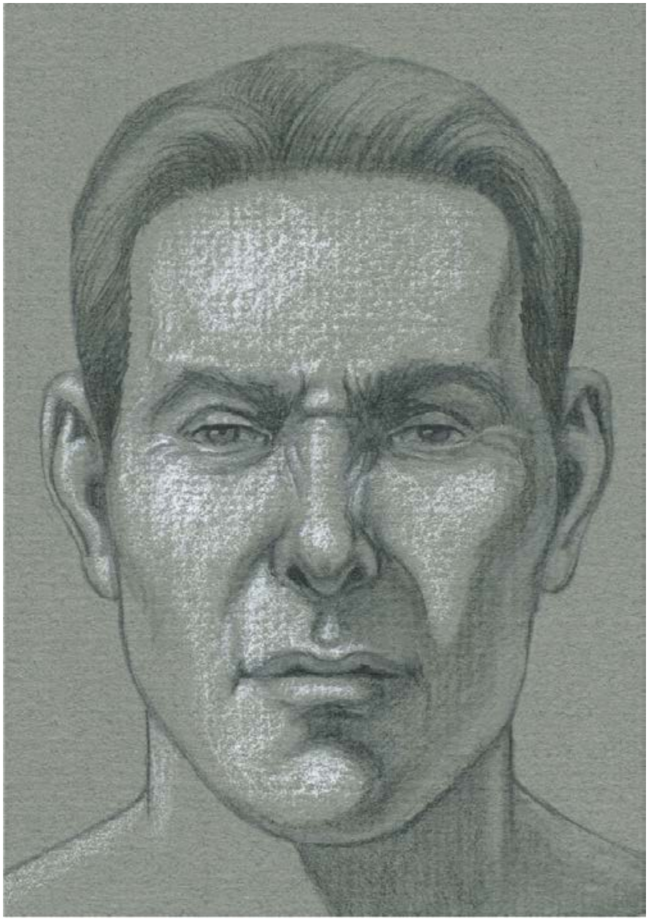
The *nasalis* (pron., nay-ZAL-iss or nay-ZAY-liss) consists of two triangular muscles positioned on both sides of the nose and joined by a fibrous strip (aponeurosis) on the bridge. Each muscle has two portions: the *transverse portion* and the *alar portion.* Both portions begin on the lower part of the maxilla (upper jaw). The transverse portions insert into the aponeurosis on the bridge of the nose, while the alar portions insert into the alar cartilages of the nose. When the nasalis muscles contract, they produce an action that is noticeable only on close inspection, lowering and compressing the wings of the nose and slightly lowering the tip of the nose.

The *levator labii superioris alaeque nasi* muscles (pron., LEV-uh-tor LAY-bee-eye

soo-PEER-ee-OR-iss uh-LEE-quee NAYZ-eye), or LLSAN muscles, are two elongated muscular strips positioned along either side of the nose. Each begins on the upper part of the maxilla (upper jaw), near the nasal bone, and then inserts into the wing of the nose, the skin of the *nasolabial furrow* (the *smile crease* near the wings of the nose), and the skin of the upper lip. When both LLSAN muscles contract, they lift up the wings of the nose (slightly dilating the nostrils), and the central upper lip. This action produces small wrinkles along the bridge and side of nose, commonly termed “crinkling the nose”—an expression of disgust or revulsion.

The next drawing shows how the wings of the nose elevate and wrinkles appear near the nose when certain muscles of the nasal group contract.

Levator labili superioris alaeque nasi, whole muscle contracting with slight contraction of the procerus muscle



Wings of the nose are elevated, causing wrinkles on the skin.

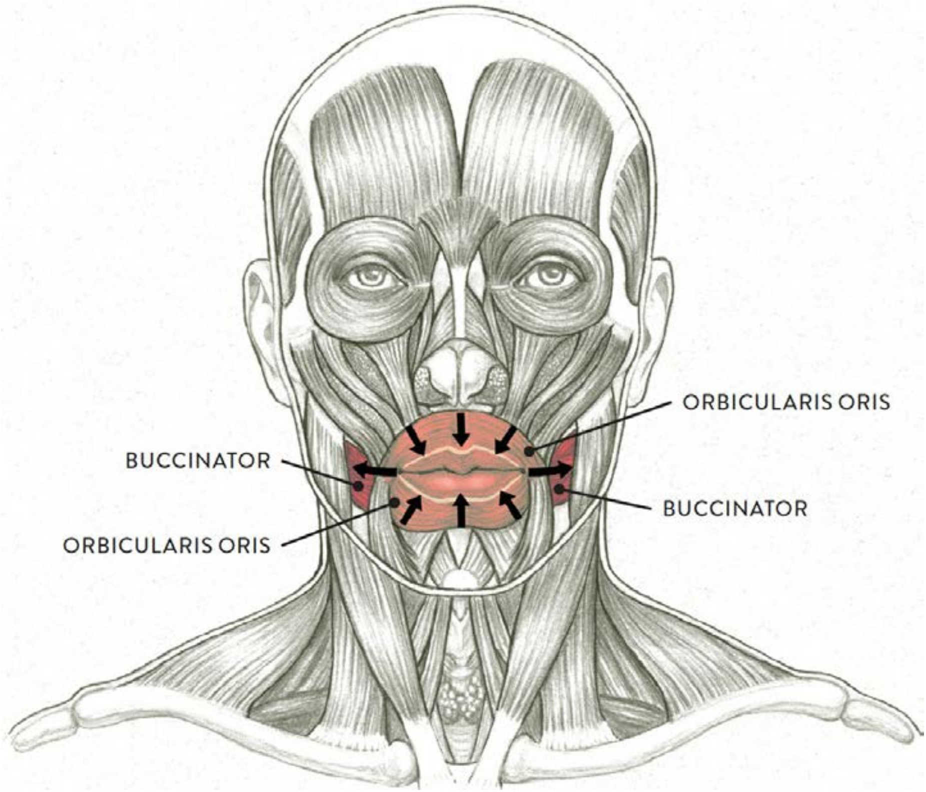
The Oral Muscle Group

Several muscles affect the lips and mouth. The main muscle is the orbicularis oris, which contains the structure of the lips. Muscles located above the orbicularis oris, collectively referred to as the *oral muscles–upper group,* pull the upper lip upward. Muscles located below the orbicularis oris, referred to as the *oral muscles–lower group,* pull the lower lip downward. A horizontal muscle called the buccinator pulls the outside corners of the

mouth horizontally.

The Orbicularis Oris and Buccinator Muscles

To keep things simple, let's start by looking at the basic oral muscle group, consisting of the orbicularis oris and buccinator muscles, shown in the following drawing.



Arrows indicate direction of muscular contraction.

The term *orbicularis oris* (pron., or-BICK-yoo-LAR-iss OR-iss or or-BICK-kyoo-LAIR-riss OR-iss) means "the circular muscle of the mouth," and the structure of this muscle is in some ways very similar to the structure of the orbicularis oculi, the circular muscle of the eye. It is a very complex facial muscle, mainly because it serves as a foundation for various muscular straps attaching into its outer borders.

The orbicularis oris has two portions: the outer circular portion and the form of the lips. The lips change their shape when the overall orbicularis oris and surrounding muscles contract in various degrees of intensity. The upper and lower lips are covered by skin on the outside and *mucous membrane* on the inside.

The muscle begins on the maxilla and mandible (upper and lower jaws) as well as on the muscle fibers of other facial muscles and the skin and fascia around the lips. It inserts into the two outer corners of the mouth (the *angles of the mouth*), helping to create the small mounds that are formed by many muscle attachments of surrounding muscles. The

term for each mound is *modiolus* (pron., moe-DIE-oh-lus), meaning “hub of a wheel.”

When the orbicularis oris contracts moderately it gently closes the lips. When it contracts more intensely it compresses the upper and lower lips tightly against each other. This action can be seen in the expressions of determination, disappointment, doubt, restraint, and concentration.

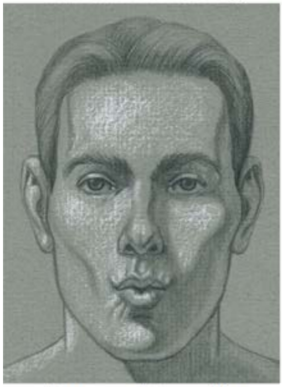
The muscle also contributes to the action of protruding the lips in a small but thick circular shape. This action is sometimes called the “pursing of the lips” because the lips are drawn together like a purse with drawstrings, with skin creases radiating outward from the lips and crossing over the boundaries of the lips. The lips purse in whistling and in kissing, and the action is one element in the expression of moderate surprise. The muscle also assists in articulation in speech and in mastication (chewing).

The *buccinator* (pron., BUCK-sin-NAY-tor) is a flat horizontal muscle that forms the muscular wall of the cheek. The muscle originates from the maxilla and mandible near the first and second molars of both bones. It inserts into the outer perimeter of the orbicularis oris as well as the outside corner of the mouth with a series of crisscrossing muscular fibers that help create the fibrous mound of the modiolus. When the buccinator contracts, it compresses the cheeks and pulls the lips tightly across the teeth, creating dimples in the skin around the outside corners of the mouth. This action occurs in smirking and in expressions of sarcasm and contempt. Along with the orbicularis oris, the buccinator is activated when musicians play brass or woodwind instruments, hence the nickname “trumpeter’s muscle.”

The following group of facial studies shows how the mouth moves when certain oral muscles contract on an otherwise neutral face.

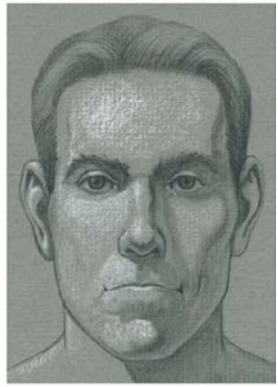
ORAL MUSCLE GROUP—THREE STUDIES

Orbicularis oris, whole muscle contracting



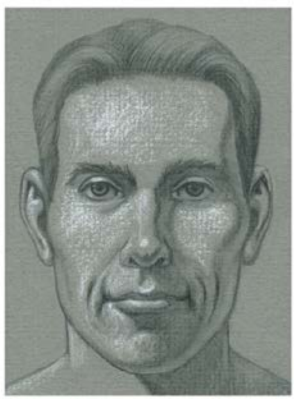
Upper and lower lips are "pursed."

Orbicularis oris, whole muscle contracting



Upper and lower lips press tightly together.

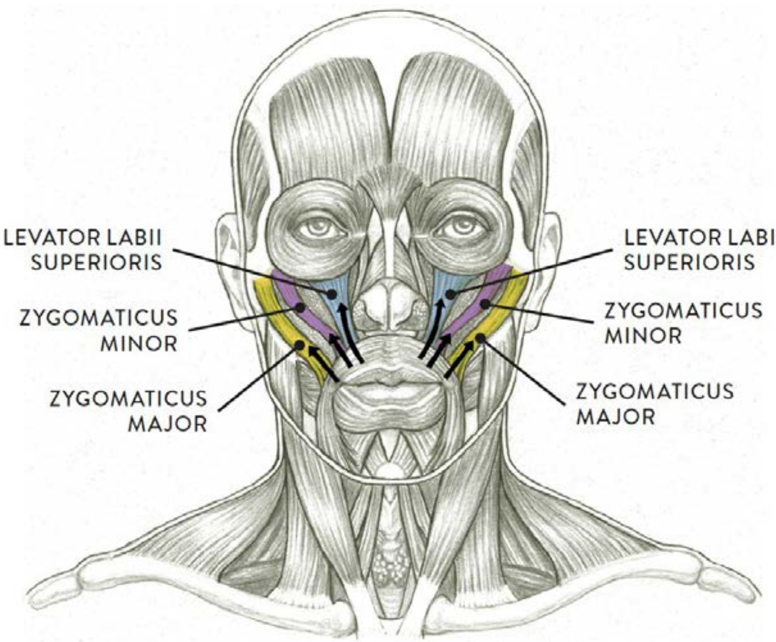
Buccinator, whole muscle contracting



Outer corners of lips are pulled horizontally.

The Oral Muscles—Upper Group

The upper group of oral muscles, located above the orbicularis oris, elevates the upper lip. The group consists of the levator labii superioris, zygomaticus minor, and zygomaticus major, all shown in the next drawing.



Arrows indicate direction of muscular contraction.

The *levator labii superioris* (pron., LEV-uh-tor LAY-bee-eye soo-PEER-ee-OR-iss or leh-VAH-tor lay-bee-eye soo-PEER-ee-or-iss) is a quadrilaterally shaped muscle positioned on either side of the nose. Its origin is on the lower border of the eye socket, on the zygomatic and maxilla bones. It inserts into the skin and upper lip, which is part of the orbicularis oris muscle. When the levator labii superioris contracts, it lifts the upper lip, creating a squared-arch shape and exposing the upper teeth. A crescent-shaped skin fold occurs in the *philtrum* region, and the crease of the nasolabial fold deepens. Expressions include contempt, disgust, and disdain. When only one side of this muscle contracts, with the other side remaining relaxed, the upper lip is pulled up on one side, giving the face a snarling or sneering expression. A subtle version of this expression is colloquially known as the “Elvis sneer.”

The *zygomaticus minor* (pron., zigh-go-MAT-ick-us MY-nor) is a slender muscle positioned near the zygomaticus major. The muscle begins on the frontal portion of the zygomatic bone (cheekbone) and inserts into the skin of the upper lip. When the zygomaticus minor contracts it pulls on the upper lip and the nasolabial fold.

The *zygomaticus major* (pron., zigh-go-MAT-ick-us MAY-jur) is a long muscular strip positioned close to the zygomaticus minor. The muscle begins on the lateral aspect

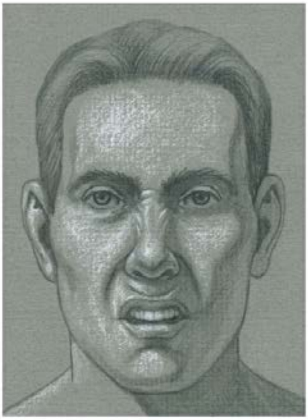
of the zygomatic bone (cheekbone) and inserts into each outer corner of the mouth (modiolus). While the muscle itself is usually not seen on the surface, it does help define the transition from the front plane of the face to the side plane of the face.

The zygomaticus major is commonly called the “smile muscle” because when it contracts it pulls on the outer corners of the mouth, producing a smile. Depending on the intensity of the contraction, many variations can occur, from subtle smiles to wide-open grins. This muscle is also activated during laughter.

The group of facial studies opposite shows how the upper lip and corners of the mouth move when muscles of the upper group of oral muscles contract on an otherwise neutral face.

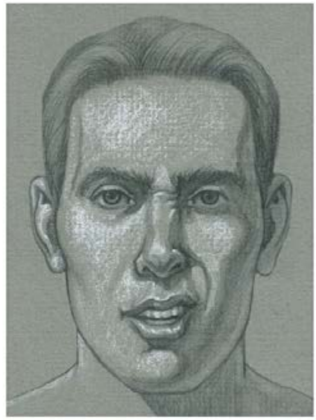
ORAL MUSCLES, UPPER GROUP—FIVE STUDIES

Levator labii superioris, both sides contracting, along with the levator labii superioris alaeque nasi (LLSAN)



Upper lip elevates.

Levator labii superioris, one side contracting, along with the levator labii superioris alaeque nasi (LLSAN)



Upper lip elevates on one side.

Zygomaticus minor and major, both contracting slightly

Outside corners of mouth elevate slightly, causing a closed-lip smile.

Zygomaticus minor and major, both contracting moderately

Outside corners of mouth elevate to expose teeth, causing an open-mouth smile.

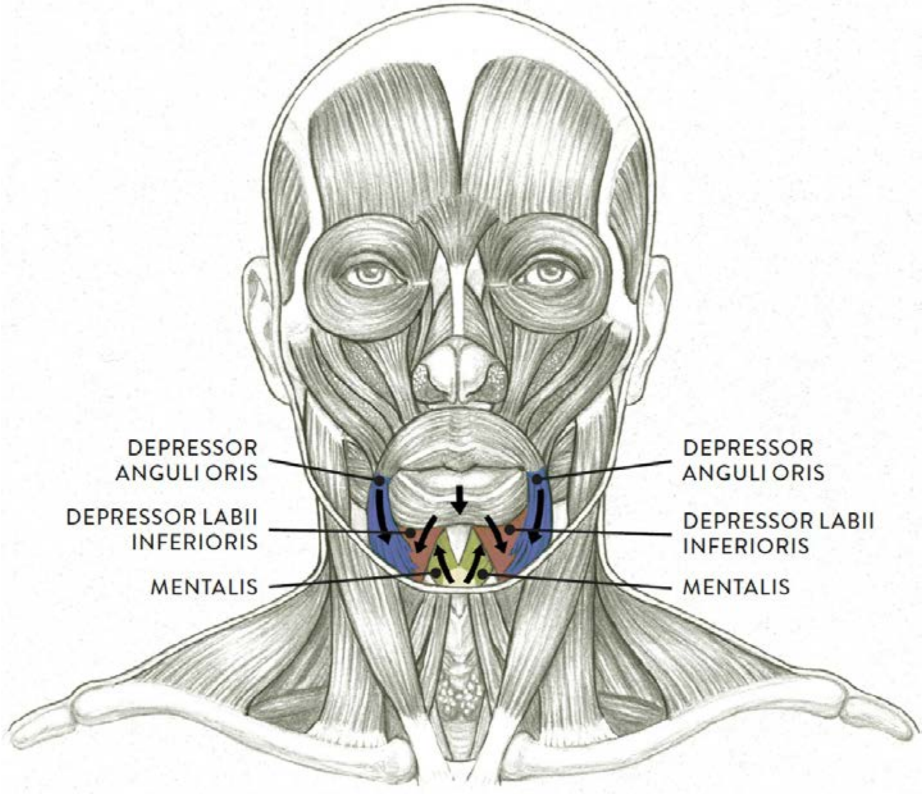
Zygomaticus minor and major, both contracting fully

Outside corners of mouth elevate, exposing teeth and causing an expansive grin.

The Oral Muscles—Lower Group

The lower group of oral muscles, located below the orbicularis oris, depress (lower) the lower lip. The muscles of this group, shown on the drawing, are the depressor anguli

oris, depressor labii inferioris, and the mentalis.



Arrows indicate direction of muscular contraction.

The *depressor anguli oris* (pron., dee-PRESS-or- ANG-yoo-lie OR-iss or dee-PREH-sor AN-gyoo-lee OR-iss) is a triangularly shaped muscle that begins on the body of the mandible near the lower border of the jaw and inserts into the skin and the orbicularis oris at the modiolus. When the depressor anguli oris muscles contract they draw the outer corners of the mouth downward, causing some downward-curving folds to appear around the outer corners of the mouth. Associated expressions include sadness, sorrow, and disappointment. A more intense contraction of this muscle, along with the contraction of the platysma muscle (see this page) will produce a grimace or a look of horror.

The *depressor labii inferioris* (pron., dee-PRESS- or LAY-bee-eye in-FEAR-ee-OR-iss) is a quadrilaterally shaped muscle on either side of the chin region. The muscle begins on the body of the mandible and inserts into the skin of the lower lip and the

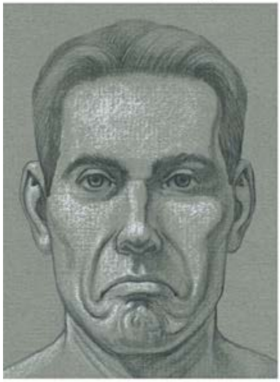
lower border of the orbicularis muscle. When the depressor labii inferioris muscles contract, they help draw the lower lip downward, slightly exposing the lower teeth. The action of this muscle is seen mostly in speech and other vocalizations.

The *mentalis* (pron., men-TAL-iss or men-TAY-iss) is a paired V-shaped muscle located in the chin region. It begins on the mandible, below the lower incisor teeth, and inserts into the skin of the chin. When the mentalis muscle contracts it pulls the skin of the chin upward, pushing the lower lip upward and outward in a “pouting” configuration. Many small dimples are seen in the skin of the chin. Depending on what is occurring in the rest of the face, the expression associated with this action can be one of defiance, anger, doubt, sadness, or determination.

The next group of facial studies shows how the lower lip moves when the lower group of oral muscles contract on an otherwise neutral face.

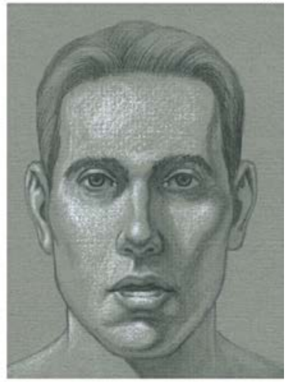
ORAL MUSCLES, LOWER GROUP—THREE STUDIES

Depressor anguli oris, both sides contracting



Outer corners of mouth are pulled downward.

Depressor labii inferioris, whole muscle contracting



Lower lip projects outward and downward.

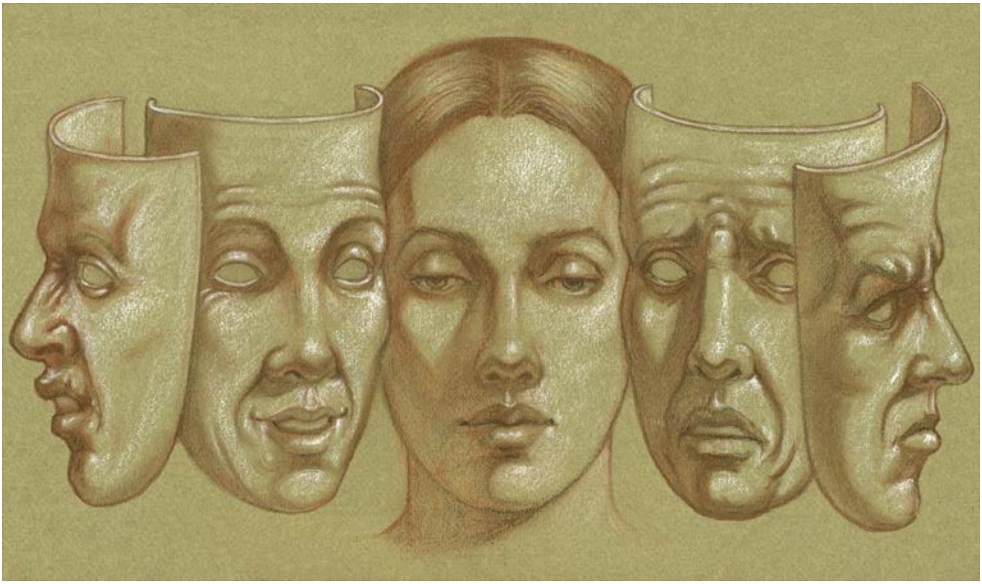
Mentalis, whole muscle contracting

Chin elevates and lower lip projects outward and down in a pouting expression.

Facial Expressions

The human face is capable of thousands of expressions, ranging from minimal, barely perceptible movements, such as a slight twitching at the corner of the mouth, to full-blown muscular contractions as seen on the face during a hysterical fit of laughter. The masks in the following study present just a few.

MASKS OF DIFFERENT FACIAL EXPRESSIONS



Sanguine and brown pastel pencils and white chalk on toned paper.

Knowing the basic mechanics of facial expressions can give your figurative work a more natural quality and enable you to depict even the subtlest movement in the facial forms, such as the slight arching of one eyebrow. Granted, some artists—especially "classical" artists, both ancient and contemporary—prefer not to incorporate facial expressions in their figures, purposely keeping the faces devoid of any emotion. But for artists who want to include facial movement in their work, the study of facial expressions is both fascinating and challenging.

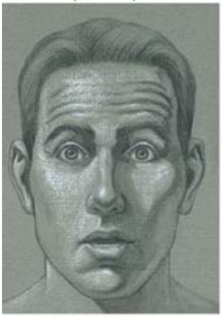
There are many ways to study expressions of the face. Young artists often begin by copying the expressions of their favorite comic book or manga characters. Usually, artists start out by learning basic expressions such as happiness, anger, sadness, fear, surprise, and disgust and from there continue to investigate variations on these basic emotions. One way to carry on that investigation is to study how each individual muscle produces a certain action when it contracts and how that action influences the skin by producing wrinkles such as laugh lines, worry lines, frown lines, or crow's feet. For example, when the frontalis muscle of the forehead lifts the eyebrows, the action produces a set of curving horizontal wrinkles on the forehead. All by itself—that is, even when the rest of the face is neutral—this action can express several emotions, including disbelief and mild surprise. When the action of lifting the eyebrows is combined with movements of the mouth, various other expressions result.

Beyond understanding how each muscle moves when it contracts, it is good to develop an awareness of the many possible *degrees* of contraction, ranging from minimal, to moderate, to full or even exaggerated contraction. You can see the effects of differing degrees of contraction in the many variations of the smile, from the subtle “Mona Lisa smile” (is she smiling or not?), to a closed-lipped smile, to a smile with a slight parting of the lips, to a large, open grin. Moreover, these differing smiles indicate different emotions when combined with the actions of other facial muscles, such as the lifting or depression of the eyebrows.

The groups of drawings on the following pages depict “mix and match” combinations of various contracting facial muscles. Do note that the activation of multiple facial muscles in multiple combinations and in varying degrees of contraction can produce countless facial expressions—many more than can possibly be explored here. Also be aware that a given expression might indicate more than one emotion.

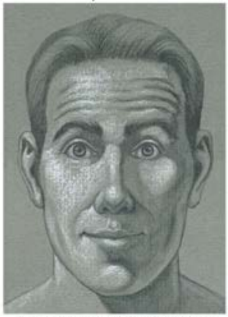
LIFTED EYEBROWS, WITH MUSCLES CONTRACTING IN THE LOWER FACE

Lifted eyebrows with slightly parted lips



Expressions: surprise, disbelief, mild shock, confusion, mild fear, being dazed, being dumbfounded.

Lifted eyebrows with closed-lip smile



Expressions: nonverbal recognition, amusement, mild pleasant surprise, anticipation, slight embarrassment.

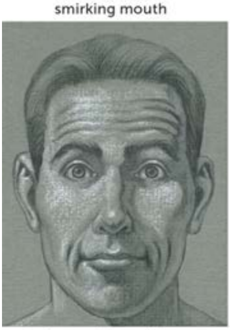
Lifted eyebrows with open-mouth smile

Expressions: pleasant surprise, happiness, delight, merriness, enthusiasm.

Lifted eyebrows with dropped jaw

Expressions: astonishment, exhilaration, excitement.

Lifted eyebrows with smirking mouth

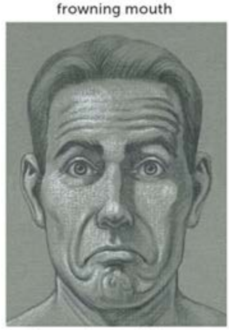


Expressions: slight skepticism, anticipation.

Lifted eyebrows with puckered lips

Expressions: amused surprise, relief, curiosity.

Lifted eyebrows with frowning mouth



Expressions: sulkiness, disbelief.

Lifted eyebrows with lifted upper lip

Expressions: disgust, repulsion, mortification.

CONTRACTED EYEBROWS, WITH MUSCLES CONTRACTING IN THE LOWER FACE

Contracted eyebrows with slightly parted lips

Expressions: questioning surprise, defiance, confrontation, perplexity.

Contracted eyebrows with closed-lip smile

Expressions: scheming, deviousness, connivance, cold calculation, sinister thinking.

Contracted eyebrows with open-mouth smile

Expressions: sadistic pleasure, salaciousness, curious amusement.

Contracted eyebrows with dropped jaw

Expressions: anger expressed through vocalization, indignation.

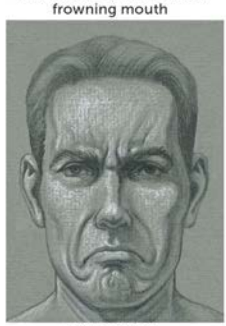
Contracted eyebrows with smirking mouth

Expressions: disbelief, doubt, distrust, annoyed perplexity, intense concentration, bitterness, puzzlement, being unconvinced.

Contracted eyebrows with puckered lips

Expressions: scorn, ridicule, mockery.

Contracted eyebrows with frowning mouth



Expressions: disapproval, contempt, being judgmental.

Contracted eyebrows with lifted upper lip

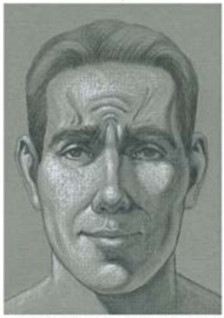
Expressions: revulsion, aversion, disgust.

LIFTED INNER EYEBROWS, WITH MUSCLES CONTRACTING IN THE LOWER FACE

Inner eyebrows lifted with slightly parted lips

Expressions: hurt, sympathy, sorrow, sadness, remorse.

Inner eyebrows lifted with closed-lip smile

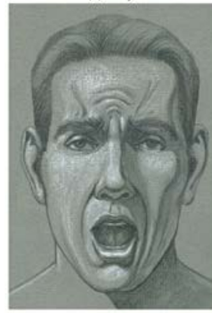


Expressions: nervousness, apprehension, worry.

Inner eyebrows lifted with open-mouth smile

Expressions: discomfort, faking a smile, trying to be upbeat while worried.

Inner eyebrows lifted with dropped jaw



Expression: yelling out in desperation.

Inner eyebrows lifted with smirking mouth

Expressions: dejection, sad disappointment.

Inner eyebrows lifted with puckered lips

Expression: sympathetic concern.

Inner eyebrows lifted with frowning mouth

Expressions: dejection, despair, grief, despondency.

Inner eyebrows lifted with upper lip lifted

Expression: sympathetic disgust.

Muscles That Move the Jaw

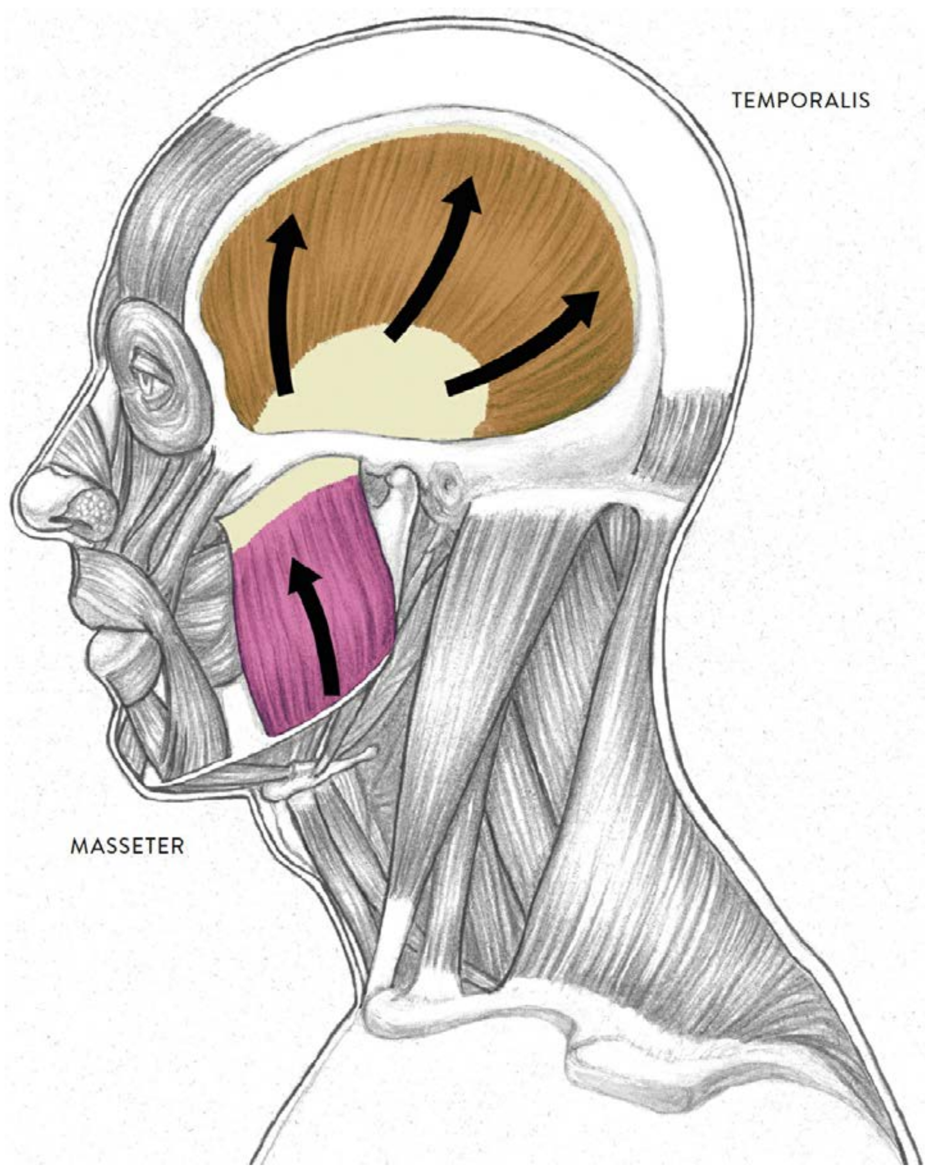
We now move from the facial muscles per se to the muscles that move the jaw (mandible). These muscles are like the skeletal muscles of the rest of the body in that they begin and insert on bones, and move bones rather than soft tissues.

The mandible, which is the only movable bone of the head, is hinged to the cranium at the temporomandibular joint (TMJ) by a series of ligaments. The movements of closing and opening the mandible are produced by two different muscle groups: One group, called the *muscles of the mandible,* attaches from the cranium into the mandible and helps close the dropped jaw. The other group, called the *suprahyoid muscle group,* attaches from the bottom portion of the mandible into the hyoid bone of the neck and helps drop the jaw.

The actions of closing and opening the jaw participate in vocalizations of differing qualities and intensities, such as humming, singing, yelling, calling out, screaming, talking, and laughing. Of course, the action of dropping the jaw without vocalizing can help create certain facial expressions, such as those indicating surprise, astonishment, and disbelief. And, as mentioned earlier, the movement of the jaw is essential for eating.

Muscles of the Mandible

The muscles of the mandible are located in the lateral (side) region of the cranium and mandible. There are two muscles in this group: the temporalis and the masseter. When they contract, they elevate (lift) the mandible, which is the action of closing an opened or dropped jaw.



Arrows indicate direction of muscular contraction.

The *temporalis* (pron., TEM-poor-AL-liss or TEM-poh-RA-liss) is a large fan-shaped muscle positioned on the side of the cranium. This muscle attaches on the outer

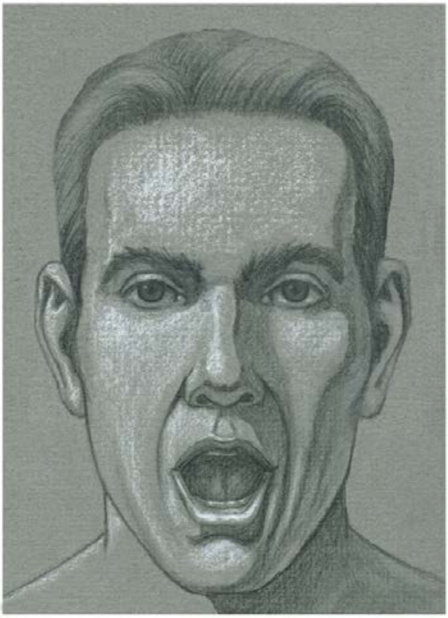
side of the cranium in a region called the temporal fossa (hence the name *temporalis*). It converges into a small tendon that attaches into the upper part of the mandible. Often, the muscle is hard to detect on the surface because it is hidden by hair. If, however, the hair is very closely cropped or the head is bald, then a small portion of the muscle near the temples can be seen when it is contracting (as in the act of chewing), creating a rippling effect on the skin.

The *masseter* (pron., MASS-ee-tur or maa-SEE-tur) is a bulky, rectangularly shaped muscle located on the outer cheek region. It begins on the lower zygomatic bone and zygomatic arch (cheekbone) and inserts into the outer surface of the mandible. The parotid gland (an ear-shaped glandular form) covers a portion of the masseter muscle. Not only does the masseter participate in the action of closing an opened jaw, but it also helps protract the mandible, moving the jaw slightly forward in the action of jutting the chin, which occurs in expressions of stubbornness or defiance. When the jaw is closed but the masseter is contracting without moving the jaw (isometric contraction), a rippling effect can be seen in the skin of the outer check. This occurs when a person is grinding his or her teeth and is seen in expressions of annoyance, nervousness, and emotional tension.

The temporal and masseter muscles and their actions are shown in the following drawings.

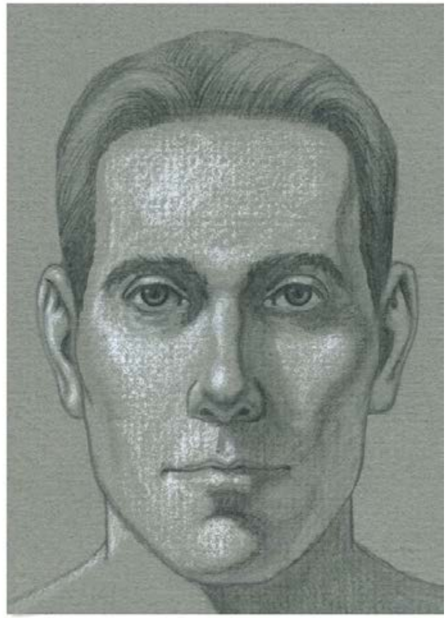
MUSCLES OF THE MANDIBLE—TWO STUDIES

Temporalis and masseter muscles, both contracting



The mandible is lifted from a dropped-jaw position.

Temporalis and masseter in relaxed, neutral state



The mandible is returned. to normal position.

The Suprahyoid Muscle Group

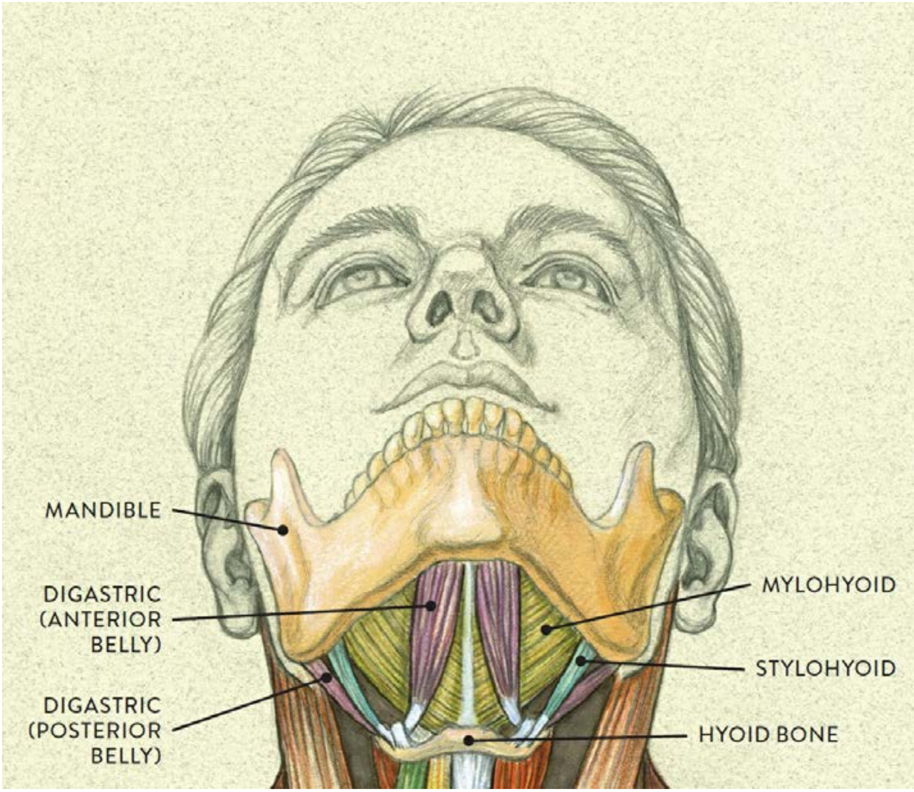
Occupying a space immediately below the jaw is a triangularly shaped region commonly called the *bottom plane of the jaw.* Its boundaries are the edges of the mandible up to the cylinder of the neck and the *hyoid bone,* a small horseshoe-shaped structure that is rarely seen on the surface except in the extreme extension (hyperextension) of the neck and head. Many small muscles attach to it, helping move it upward and downward (along with the larynx) during the action of swallowing.

The three main muscles of the bottom plane of the jaw are collectively known as the suprahyoid muscles; the term *suprahyoid* means “above the hyoid.” These muscles are the digastric (anterior and posterior bellies), the mylohyoid, and the stylohyoid. Their main function is to depress (lower or open) the jaw and elevate (lift) the hyoid bone.

The bottom plane of the jaw is an important shape for artists to indicate (if it can be seen in a given pose) because it is a transition to the cylindrical form of the neck. Some

beginning figurative artists have a tendency to neglect the bottom plane of the jaw when it is visible in a pose, giving this transitional area an unnatural flatness. Indicating shadows and reflected light in this region helps create the transition. The bottom plane of the jaw is mostly seen in three-quarter and side views and usually cannot be seen directly from the front unless the head is tilting back.

SUPRAHYOID MUSCLE GROUP



Anterior view of head tilting back

Open-Mouth Expressions

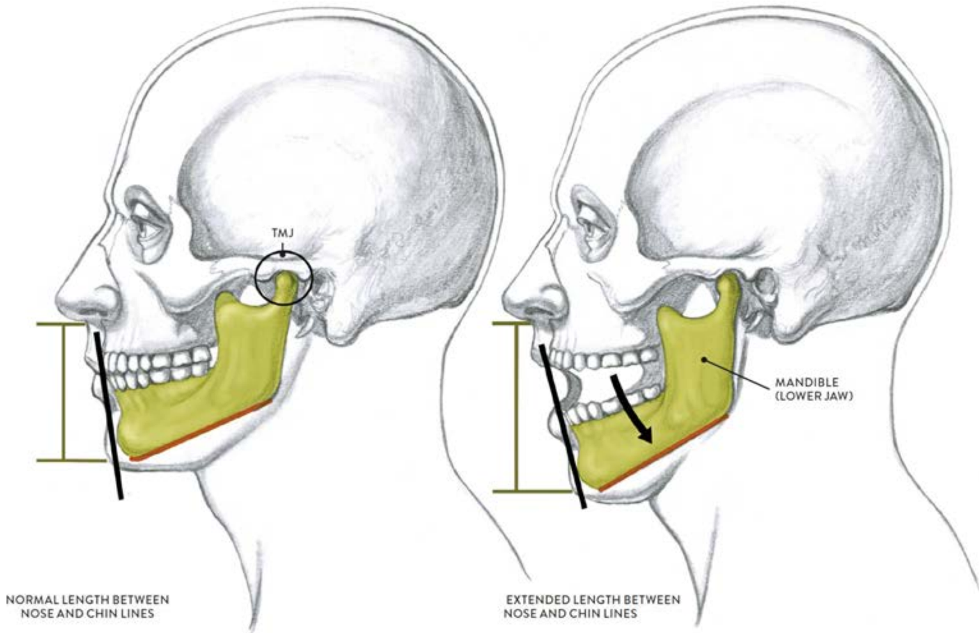
As previously discussed, the mandible (lower jawbone) is the only movable bone of the cranium, and its movement takes place at the temporomandibular joint, or TMJ. Movements of the lower jaw include forward and backward movements (protraction and retraction) as well as side-to-side movements (adduction and abduction), but the jaw's main action is to lower, opening the mouth, and then close back up again (depression and elevation). Some artists find this action challenging to depict, so here are a few tips to follow when drawing an open-mouth expression (also summarized visually in this drawing):

1. *Respect the limitations of jaw movement.* Some artists tend to drop the jaw

farther down than it can actually go, giving the face a strange, distorted look. Because of the bony restrictions of the TMJ and the ligaments that bind the joint, the mandible can only open to a certain degree—at maximum about two inches, or three finger-widths between the upper and lower front teeth. The soft forms of the lips, however, can stretch beyond the limitation of the TMJ, which is why the mouth can appear to open wider.

2. *Add some length to the face.* An opposite issue is that some artists do not add enough extra length to the front of the face when depicting an open-mouth expression. Proportionally speaking, the distance from the top of the head to the chin is greater when the jaw is dropped than when the mouth is closed, so make sure you place the bottom of the chin slightly lower than it would be normally. But be careful not to overdo it; adding too much length will make the jaw look dislocated.

3. *Keep in mind that the chin swings slightly back when the jaw is lowered.* Looking at a mouth opening from a side view, you see that the jaw does not drop straight down vertically but rather at a slight angle. Be sure to check the alignment between the front portions of the lips, teeth, and chin, as indicated by the black line in the drawing below. Also check the angle of the bottom border of the lower jaw. Since the chin drops down and swings back, this border is more tilted when the jaw is open. (It will be harder to detect the lower border of the jaw if the person you're portraying has substantial subcutaneous tissue in this region.)



The heavy black lines show the change in alignment between the upper and lower jaws when the mandible (lower jaw) drops. The orange lines show the increasing tilt of the lower border of the jaw. The arrow in the drawing at right shows the direction of the dropping of the jaw (depression of the mandible).

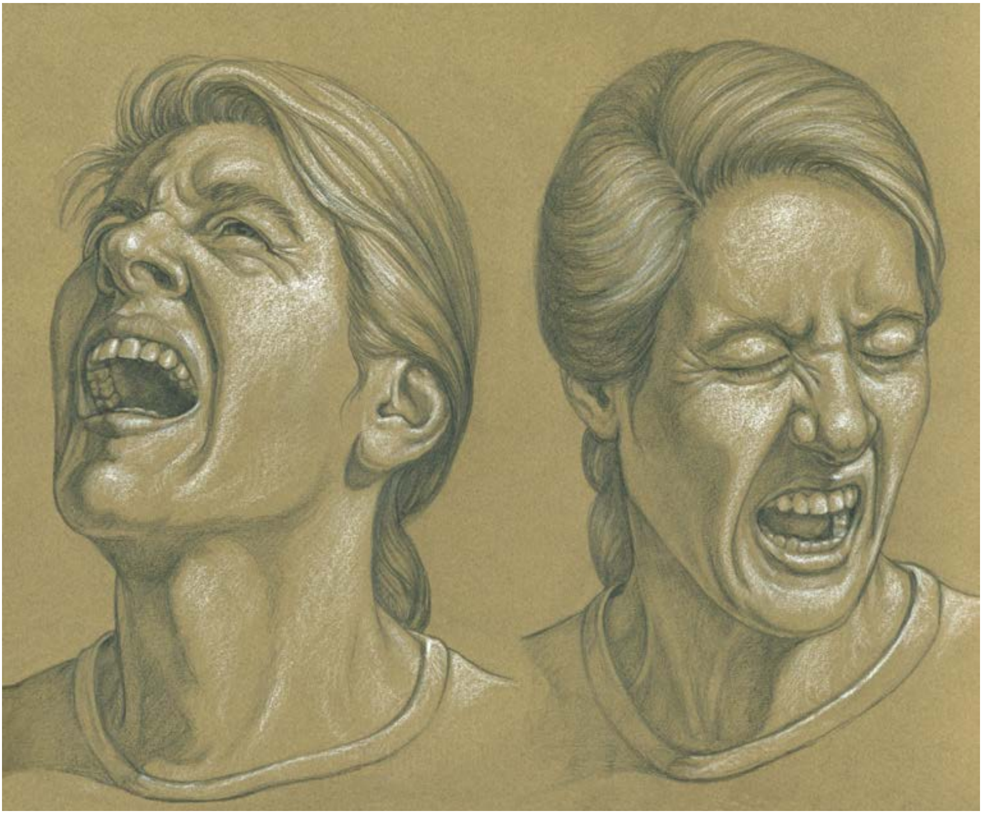
The Teeth and Dental Arches in Open-Mouth Expressions

In a smile with parted lips and a closed jaw, you generally will see six front teeth on the upper dental arch—the four incisors and two cuspids. If the lips are positioned farther apart with the jaw dropping downward, you may see a few of the front teeth on the lower dental arch, as well. As can be seen in the life studies below, in very exaggerated open-mouth poses, you might see a portion of the horseshoe shape of the upper or lower dental arch, depending on the way the head is positioned and the vantage point from which you view the head.

Drawing the dental arches within an open mouth can be quite challenging. When the mouth opens, the upper and dental arches are pulled apart, with the upper arch remaining stationary while the lower arch drops. If you are sitting at eye level with a model whose jaw is dropping in an exaggerated way, you will be able to see a certain portion of the horseshoe shape of the lower dental arch. If you are viewing that model from a lower

vantage point, or if the model's head is dramatically tilted back, you will most likely see some of the upper dental arch.

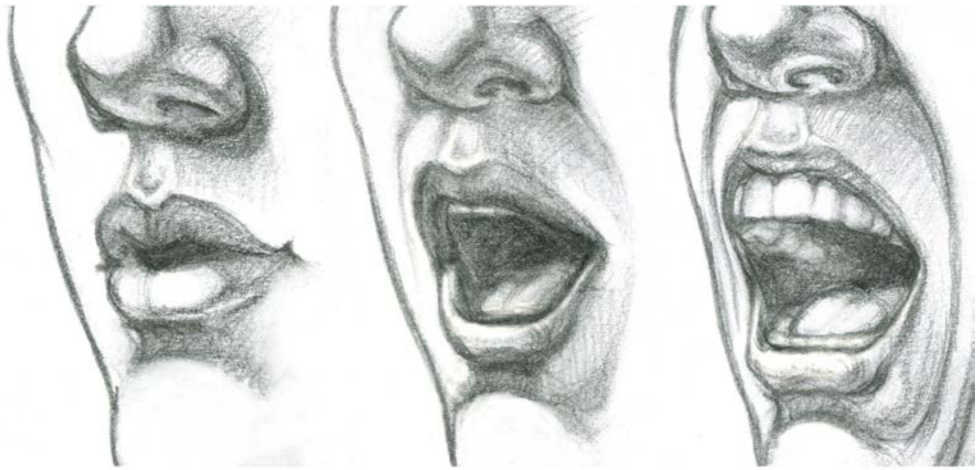
If the front teeth are clearly seen in an open-mouth expression, make sure to line the teeth up correctly: The two large incisors (front teeth) of the upper dental arch should be placed on either side of the midline of the face with the other incisors positioned next to them. Any other teeth you see should appear to slightly recede because of their positions on the horseshoe-shaped dental arch. (The same principles apply to the lower dental arch.) Avoid outlining each tooth heavily, instead depicting the front portion of the dental arch as a simple shape, with very lightly drawn lines separating the teeth.



Graphite pencil and white chalk on toned paper.

The Lips in Open-Mouth Expressions

When the jaw drops, the lips are stretched in different ways, depending on which muscles are activated to create a certain expression or configuration of the mouth. The lips can be stretched vertically or horizontally or can protrude outward. If the jaw is dropped in an exaggerated way, the upper lip will wrap snuggly around the curvature of the teeth. The next drawing shows how the lips change shape as the jaw drops and how this action produces creases on the skin.



LEFT: Lips and lower jaw in neutral position

CENTER: Lower jaw dropping with lips pulling part

RIGHT: Lower jaw dropping to maximum position

The upper lip wraps tightly around the upper teeth, and the lower lips stretch as far as possible.

Other Aspects of Open-Mouth Expressions

Opening the mouth involves the action of two different kinds of "hinges": One is the bony hinge of the TMJ; the other is the soft-tissue hinge of the corner of the mouth. Each corner of the mouth (also known as the *commissure of the mouth*) act as a hinge whenever the upper and lower lips pull apart from each other. These outer corners can stretch in slightly different directions (forward, upward, downward) depending on which muscles are contracted, but they never disappear completely, even in an exaggerated open-mouth expression in which the lips are stretched as far as possible.

The space between the lips is an important consideration when depicting various open-mouth expressions. The opening can appear as a vertical oval shape or a rectangular or square shape. Sometimes it is an elongated horizontal oval, with tapered corners at each end. And in three-quarter views, the opened space might have a contorted, kidney-bean shape. Getting the shape right is key to drawing a convincing opened mouth.

When the jaw drops, various skin creases appear in the lower face. Most notable are the *nasolabial folds,* which begin near the wings of the nose and swing in curves around the outer perimeters of the orbicularis oris muscle. Shown in the following drawing, the

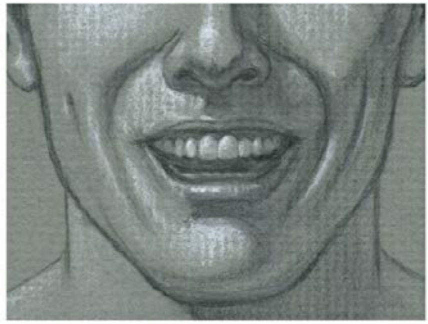
nasolabial folds are activated in smiling, in expressions of disgust, and also in wide-mouth expressions in which the jaw drops dramatically. Depending on the shape and action of the lips, the nasolabial folds can be angular or curved. Additional skin folds may also appear around the chin, curving upward into the lower face.

NASOLABIAL FOLDS

Relaxed face

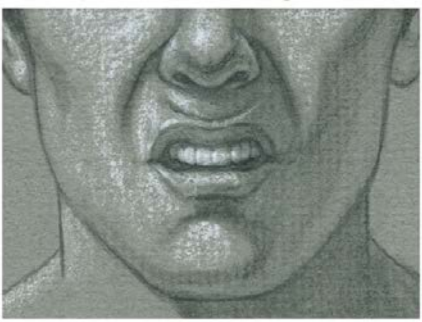
The nasolabial folds are soft plane changes near the wings of the nose and the outer edges of the orbicularis oris muscle.

Smiling or laughing expression



The nasolabial folds lengthen, producing semicircular creases in the skin.

Expression of disgust



The nasolabial folds grow more angular near the wings of the nose. An additional crescent-shaped fold occurs above upper lip.

Dropped jaw

The nasolabial folds become stretched and elongated.

When the jaw drops, it stretches the muscles of the jaw and lower face as well as the skin and subcutaneous tissue, making the lower part of the face appear narrower when viewed from the front. The bottom plane of the jaw and the muscles and other soft tissues in this region can become compressed, appearing as a thick roll on a lean person or as multiple rolls on a heavy person.

To study how the lips change shape on an opened mouth, you may want to collect

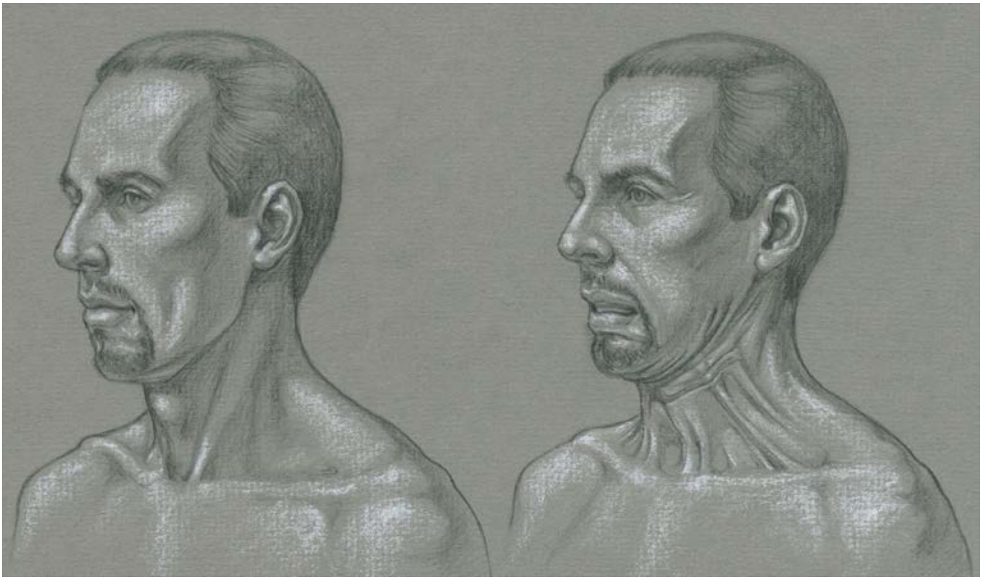
photo references, possibly including photos you take yourself of people—friends, family, hired models—making different expressions with their mouths open. While such photos might look staged, they can serve you well as basic guides. Observing the faces of singers, especially opera singers, can also be helpful. Professional singers learn to pronounce syllables in an exaggerated way so that the words they sing can be clearly heard by an audience. An interesting exercise is to freeze-frame a video of a singer and do quick sketches of the singer's face, emphasizing the mouth region. The same exercise can be done with film or TV actors: freeze the video when they are engaging in emotional exchanges of dialogue, and do quick studies of the close-ups.

For real-life facial expressions that do not look staged, try drawing from photos of people reacting emotionally to various events, such as sports events, tragic news events, and so on. Such photos show raw, unrehearsed emotion.

The Platysma and Risorius Muscles

There is one muscle that, though it is mostly not located on the face, can have a significant effect on some facial expressions. This is the *platysma* (plah-TIZ-mah), a thin, sheetlike muscle embedded within the subcutaneous layer and fascia on the neck and upper chest region. As shown in the drawing below, the platysma begins in the fascia of the chest near and around the clavicles and inserts into the base of the mandible, each modiolus (angle of the mouth), and the skin of the lower lip and cheek region. When the platysma muscle contracts, it tenses the skin on the neck and lower face. Cordlike vertical skin ridges, called *platysmal banding,* appear on the front of the neck, as do some transverse skin creases. The platysma also pulls the corners of the mouth downward and lowers the mandible, producing a grimace, as can be seen in the right-hand study in the following drawing. The full contraction of the muscle is seen in expressions of terror, disgust, and extreme pain. This muscle, not seen on a youthful person unless contracted, does become more noticeable as people age. The vertical neck folds (platysmal banding) are caused by the loosening of the platysma muscle, which occurs when the fatty tissue dissipates and the skin, along with the muscle, loses its elasticity, giving the neck region a “creped” (wrinkled) appearance. These ridges are colloquially called “wattles” or “turkey neck.”

PLATYSMA—TWO STUDIES IN THREE-QUARTER VIEW

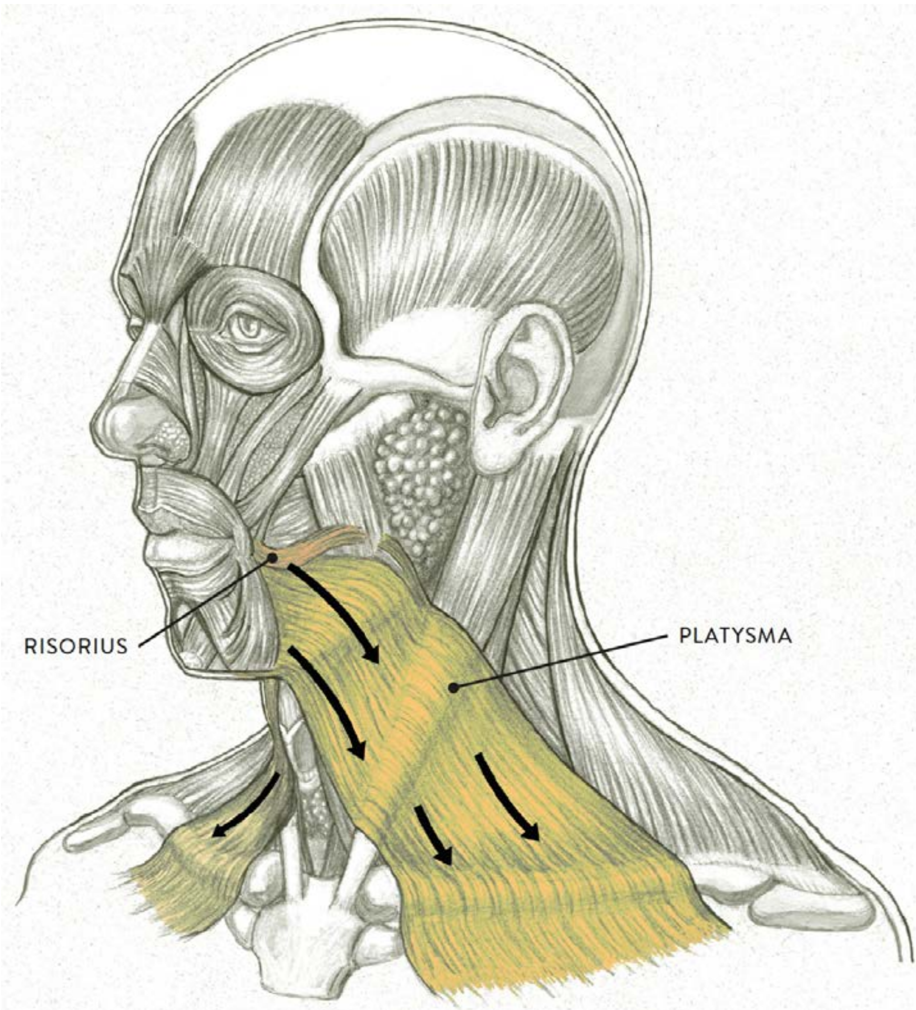


LEFT: Platysma muscle relaxed

RIGHT: Platysma muscle contracting

The *risorius* (pron., rih-SOR-ee-us) is a slender muscle, with only a few muscle fibers, positioned below the zygomaticus major. Near the modiolus (angle of mouth), the muscle's fibers blend with some of the fibers of the platysma muscle (see this page). The risorius begins on the fascia over the platysma muscle and inserts into the skin at the modiolus. When the risorius muscles contract they stretch and tense the lips at their outer corners, especially when the mouth widens during laughter or in a strained expression such as a grimace.

PLATYSMA, WITH RISORIUS MUSCLE—THREE-QUARTER VIEW



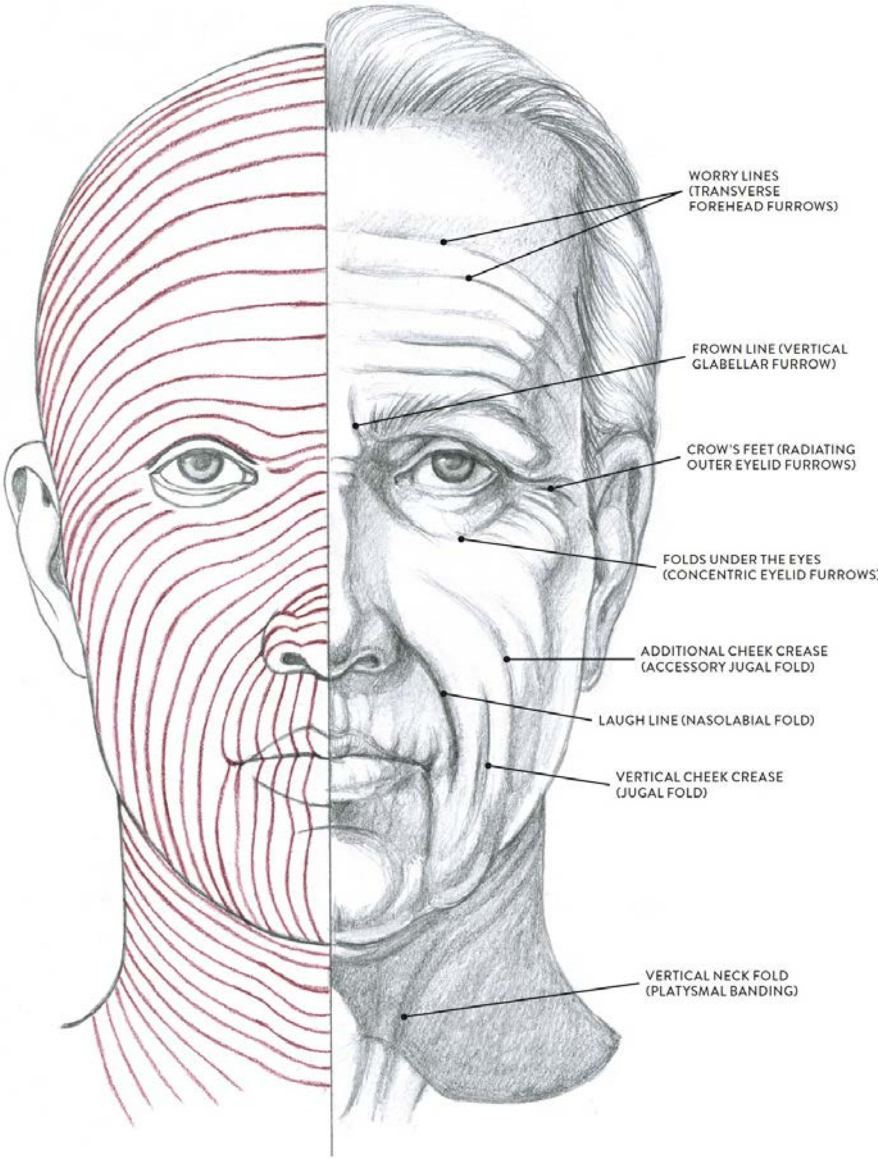
Arrows indicate direction of muscular contraction.

Facial Wrinkle Patterns

Artists who truly want to understand facial expressions should be aware of the patterns of wrinkles that occur in the skin of the face, growing more pronounced and permanent as a person ages. Throughout the body, series of natural linear pathways composed of collagen fibers are embedded within the aponeurotic sheets of deep fascia. These are called *Langer's lines,* after the Austrian anatomist Karl Langer (1819–1887), who was one of the first to map them. Surgeons use these lines as guides for incisions to ensure better healing. Most Langer's lines are not visible on the surface form, but some correspond closely to the skin creases in the face (called expressive lines or dynamic lines) that are activated by contracting facial muscles during expressions. The following list gives their common names, their anatomical names, and the facial expressions with which they are associated:

- *Worry lines* are transverse (horizontal) forehead furrows that occur in expressions of surprise and worry.
- *Crow's feet* are radiating outer eyelid furrows that occur in expressions of amusement and laughter.
- *Frown lines* (vertical glabellar furrows) occur in expressions of anger and annoyance.
- *Laugh lines* (nasolabial folds) occur in smiles and laughter.
- *Vertical cheek creases* (jugal folds, accessory jugal folds) occur in smiling, laughing, and smirking.
- *Folds under the eyes* (concentric eyelid furrows) occur in smiling and laughter when the cheeks are pushed up into the lower eye-socket region.
- *Vertical neck folds* (platysmal banding) occur in grimacing and expressions of terror.

LANGER’S LINES AND FACIAL WRINKLE PATTERNS



LEFT: Langer’s lines

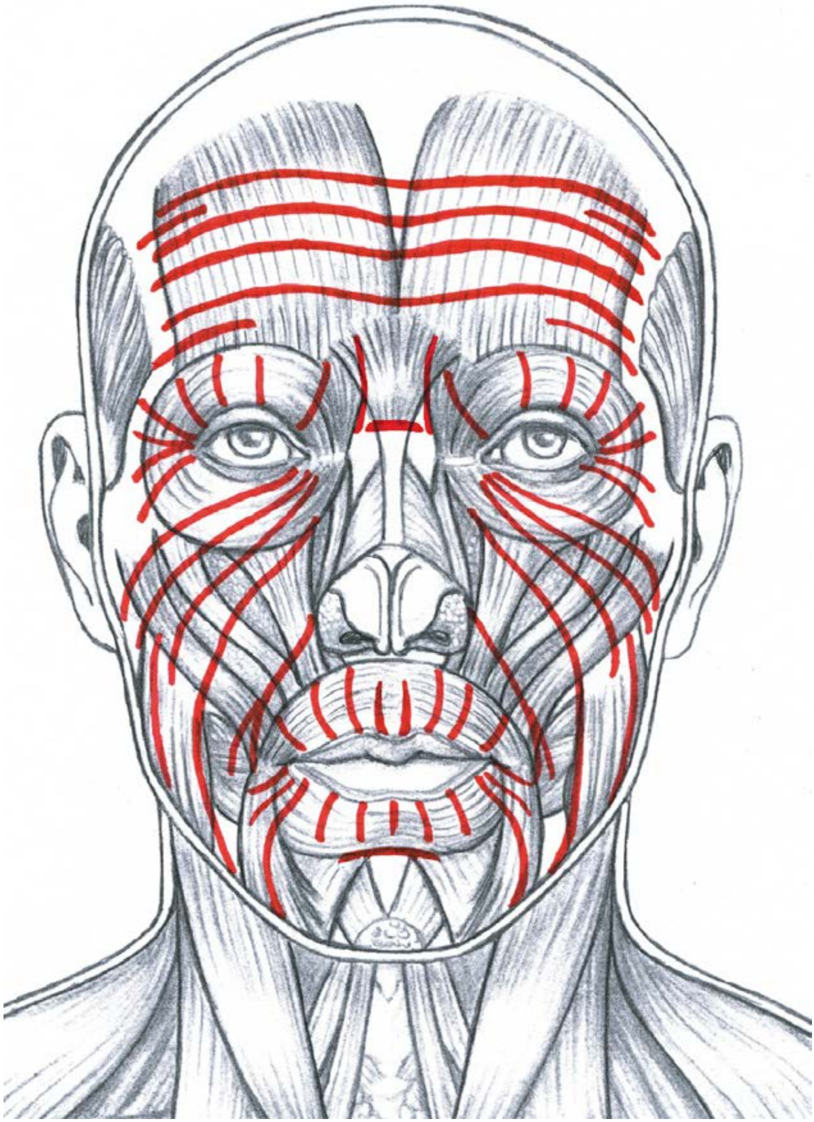
RIGHT: Pattern of facial wrinkles

Over time, as the elasticity of the skin is weakened by aging, these skin creases

(wrinkles) become permanently “etched” in the facial skin, making the pathways of the Langer’s lines more visible. The drawing opposite clearly shows how facial wrinkles follow pathways that are almost identical to those of the Langer’s lines. Awareness of the general pattern of Langer’s lines can help artists place various facial wrinkles more accurately—knowledge that can be applied when depicting facial expressions generally or in studies of elderly faces.

Wrinkles occurring in a facial expression are usually perpendicular to the underlying contracting muscle fibers. For example, the frontalis muscle of the forehead contracts in a vertical direction (lifting the eyebrows upward), yet the wrinkles created on the surface of the skin are horizontal, like the Langer’s lines in this region. The next drawing shows the basic wrinkle pattern of the skin superimposed on the underlying muscles.

WRINKLE PATTERN OF FACE, PERPENDICULAR TO UNDERLYING MUSCLES



The red lines indicate the general pattern of facial wrinkles, corresponding to the dynamic lines of facial expressions. The wrinkles generally run perpendicular to the underlying muscle fibers.

MALE FIGURE IN THREE-QUARTER VIEW

Graphite pencil and white chalk on toned paper.

Chapter 5

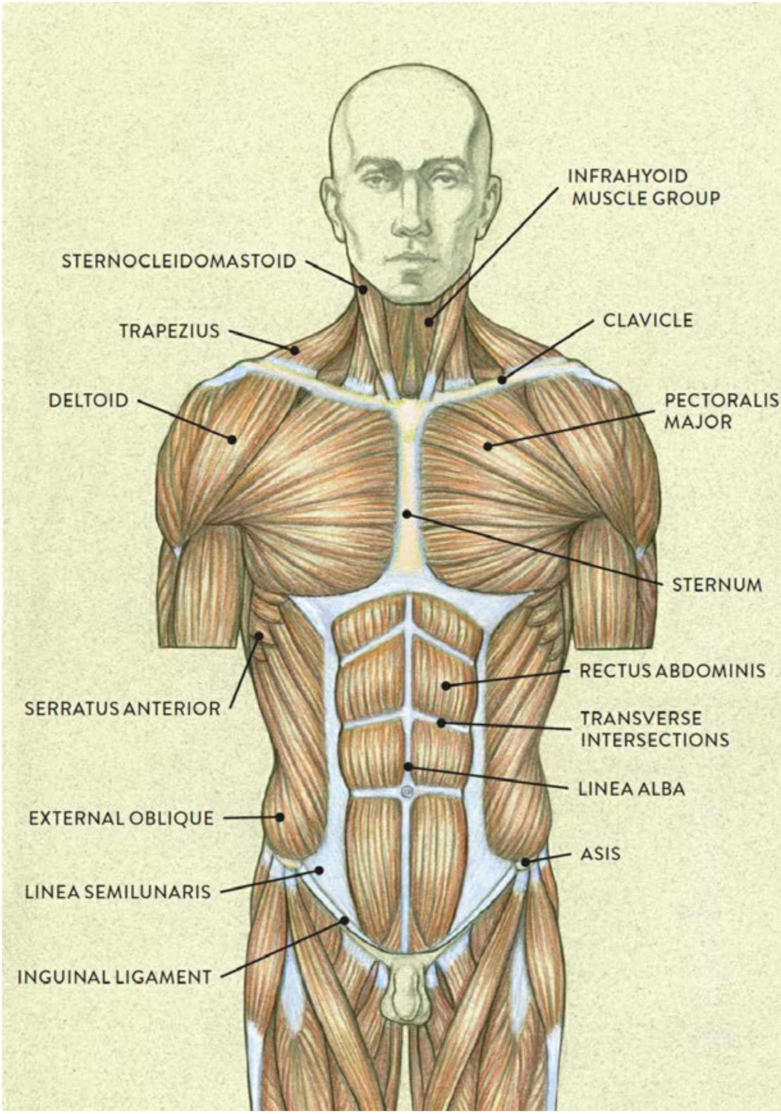
Muscles of the Neck and Torso

The muscles of the torso are interesting on many levels. First, unlike the muscles of the facial region, their shapes are somewhat recognizable on the surface. Second, some of the superficial muscles are already known by most people, though most likely by their common names: the shoulder muscle (trapezius), the chest or pectoral muscle (pectoralis major), the "abs" or "six-pack" (rectus abdominis), and the "flank pad" or "love handles" (external oblique). Third, the muscles of the torso do not move just the torso (vertebral column and rib cage) but also the shoulder girdle, which includes the scapula bones and clavicles, as well as the upper arms (humerus bones).

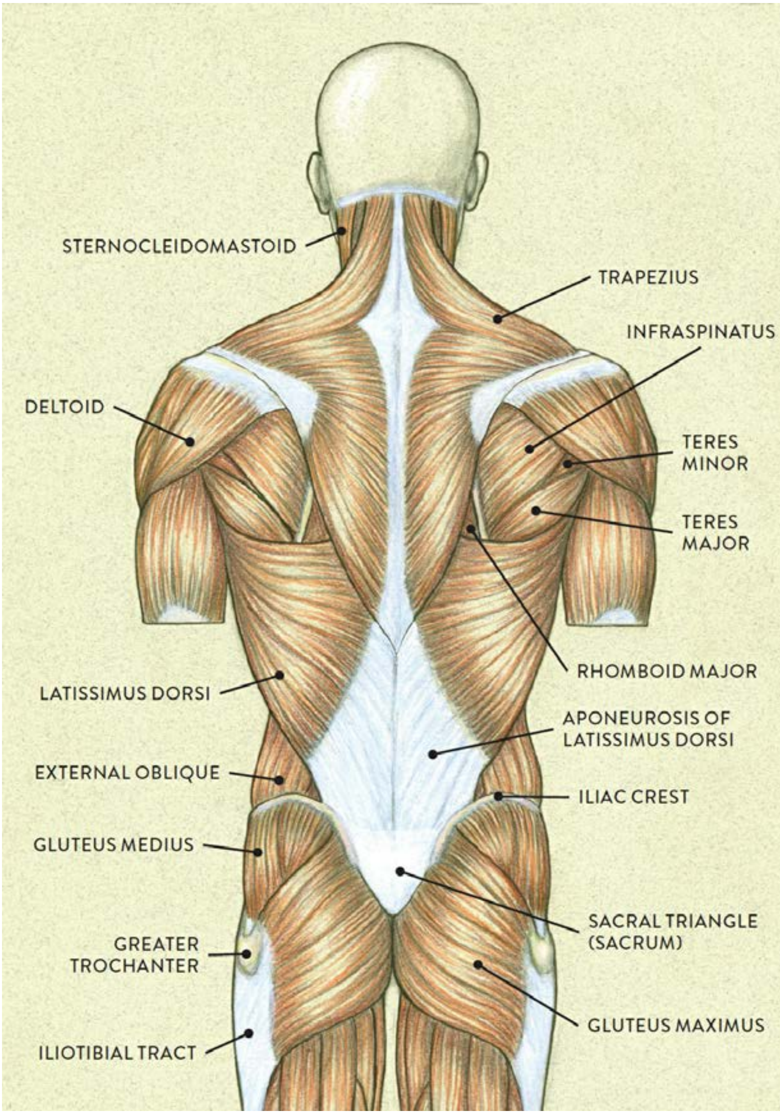
There are many ways to categorize the torso muscles. One way is to group them by their location on the anterior, lateral, and posterior regions of the body, but they can also be classified by anatomical regions (abdominal region, scapular region, pectoral region) or by their placement in relation to the surface (superficial layer, intermediate layer, deep layer).

For learning purposes, a combination of systems is used in this chapter. First, let's look at the torso muscles according to their placement on the body from front (anterior), back (posterior), and side (lateral) views, as shown in the following drawings.

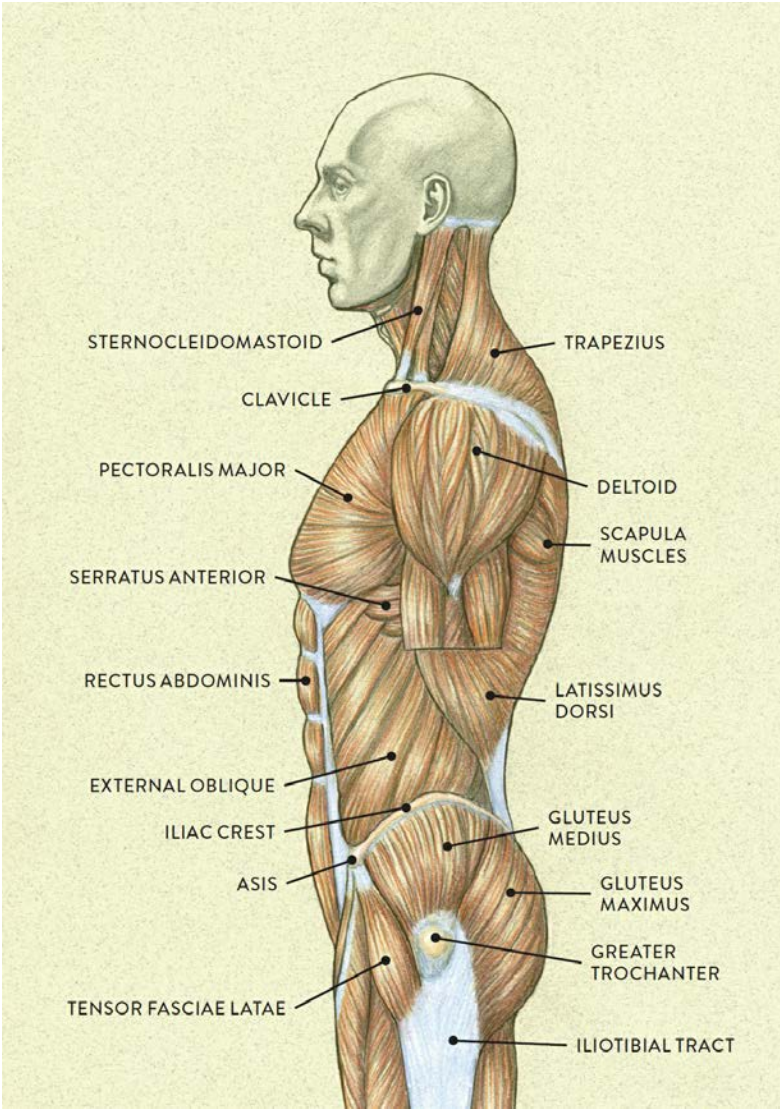
MUSCLES OF THE TORSO—ANTERIOR VIEW



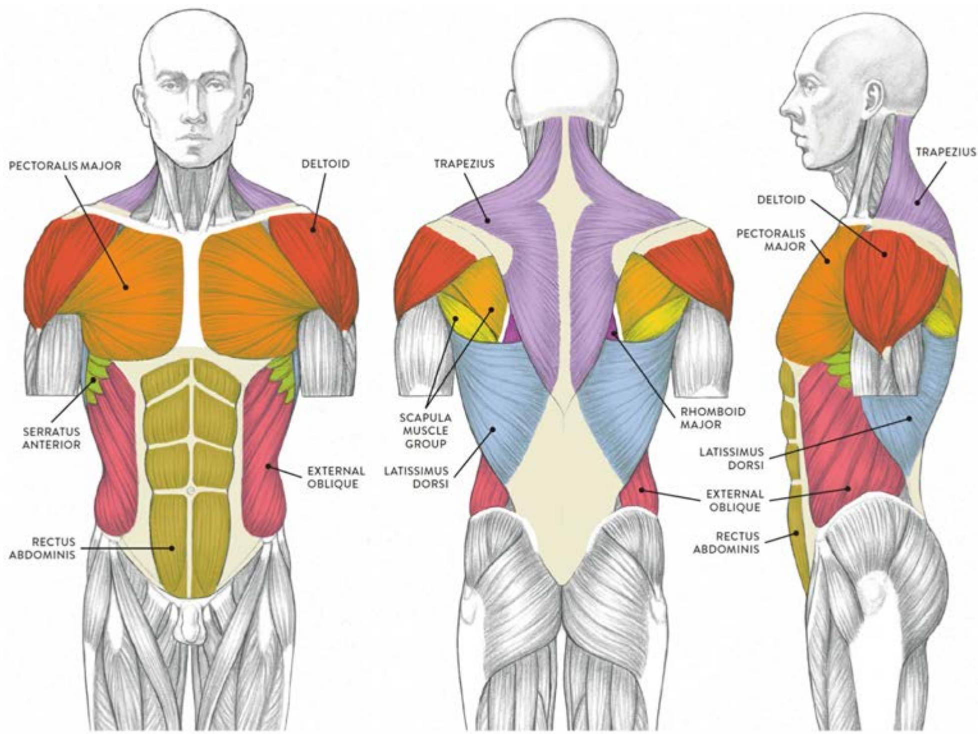
MUSCLES OF THE TORSO—POSTERIOR VIEW



MUSCLES OF THE TORSO—LATERAL VIEW



MUSCLES OF THE TORSO INDICATED BY COLOR



LEFT: Anterior view

CENTER: Posterior view

RIGHT: Lateral view

Names of Torso Muscles

The names of torso muscles provide clues to their location, shape, size, or the direction of their muscle fibers.

- *Abdominis* pertains to the abdominal region.
- *Pectoralis* pertains to the chest region.
- *Anterior* means "front."
- *Dorsi* means "back."
- *Spinalis* or *spinatus* indicates a location on or near a sharp bony projection,

or spine.

- *External* means “outer.”
- *Internal* means “inner.”
- *Major* means “larger.”
- *Minor* means “smaller.”
- *Rectus* means “straight.”
- *Oblique* means “slanted” or “diagonal.”

Muscles of the Neck

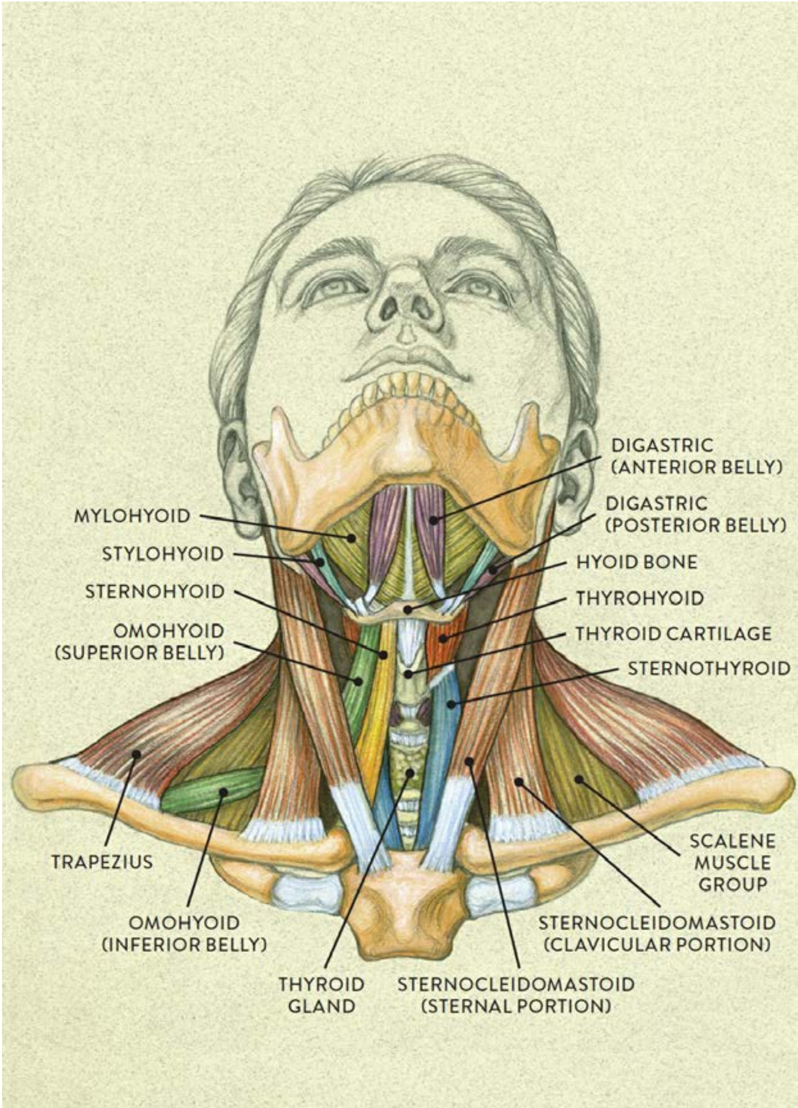
Before moving on to the individual muscle groups of the torso, let's pause for a moment to look at the muscles of the neck—the transitional area between the head and torso. We already began doing so in the previous chapter, where I covered the suprahyoid muscles (this page) and the platysma (this page), which play roles in moving the jaw and in facial expressions. Here, we'll focus briefly on the sternocleidomastoid (SCM) and the infrahyoid muscle group. The major muscle of the back of the neck, the trapezius, is involved in movements of the scapula and is dealt with in the next section, on the muscles of the thorax.

The *sternocleidomastoid* (pron., STIR-no-KLIE-doe-MASS-toid) is a straplike muscle positioned on either side of the neck. This muscle begins at two different locations, one on the sternum (*sternal portion*) and the other on the clavicle (*clavicular portion*). The muscle fibers eventually merge into one shape, which inserts into the *mastoid process* (a small protrusion of bone on the skull behind the ear) and along a small ridge called the *superior nuchal line of the occipital bone.*

The sternocleidomastoid muscle helps bend and twist the head and neck in different directions, including flexion (bending the head forward), lateral flexion (bending the head sideways), and rotation (twisting the head left or right).

The *anterior triangle of the neck region* is located between the inside borders of the sternocleidomastoid muscles, the top portion of the sternum (manubrium), the hyoid bone, and the lower border of the digastric muscle (posterior belly). It contains several important structures, including the larynx (voice box), trachea (windpipe), and thyroid cartilage and gland. It is also the location of four straplike muscles collectively referred to as the *infrahyoid muscles,* which means the muscles *below* the hyoid bone. The four muscles are the *superior belly of the omohyoid,* the *sternohyoid,* the *thyrohyoid,* and the *sternothyroid.*

The infrahyoid muscles within the anterior triangle of the neck are rather hard to see on the surface form, but on some occasions, depending on the position of the neck, one or two muscles might be detected, as when the head bends back and the sternohyoid muscles create subtle vertical ridgelike forms on either side of the thyroid cartilage. The following drawing on this page shows the muscles of the neck and shoulder region. (For discussion of the muscles of the suprahyoid group—digastric, mylohyoid, and stylohyoid—see this page.)



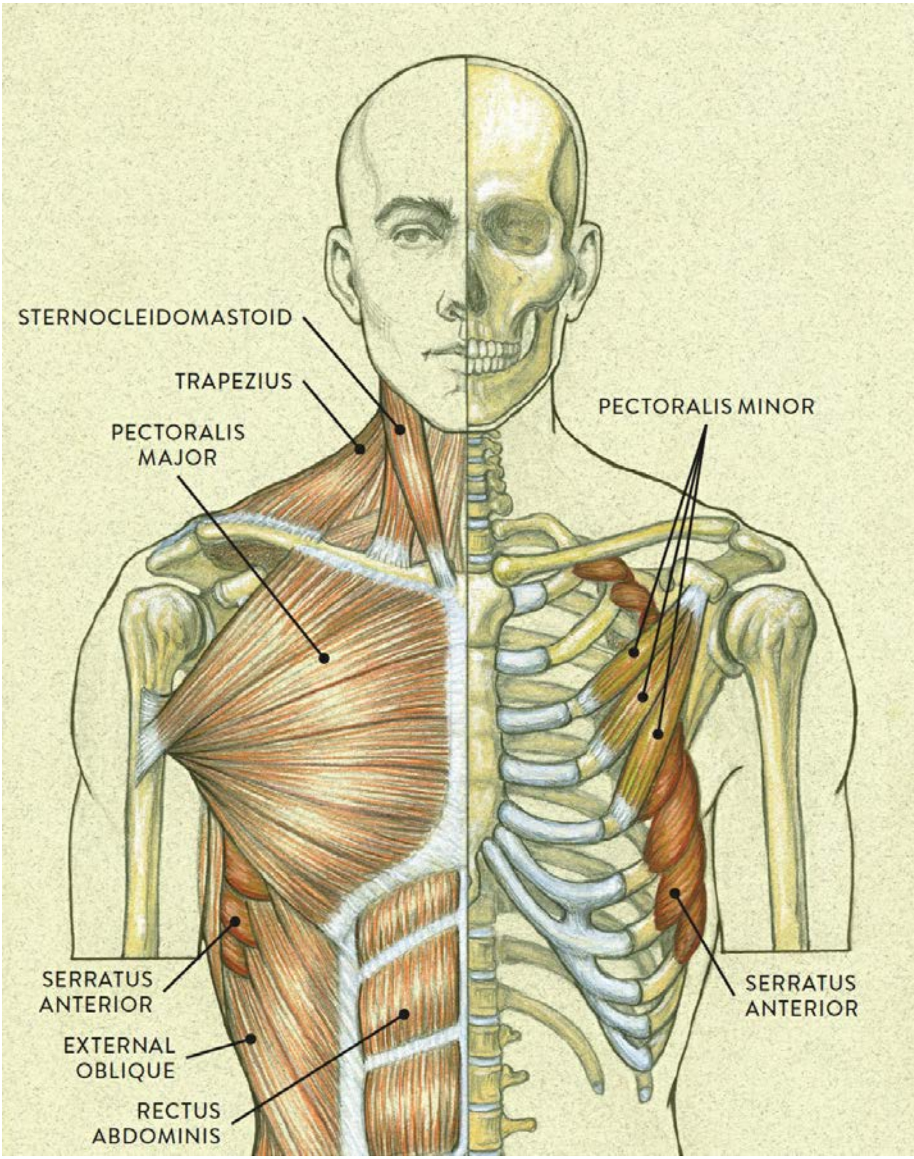
Anterior view of head tilting back

Muscles of the Thorax

The *thoracic muscles* attach on the anterior and lateral regions of the thorax, or rib cage. They are the pectoralis major, the pectoralis minor, and the serratus anterior. The pectoralis major muscle helps move the humerus, and the pectoralis minor and the serratus anterior muscles help move the scapula bone.

THORACIC MUSCLES

The torso is divided in half to show the two layers of muscles in this region. The muscles on the left side are the superficial muscles (close to the surface), and the muscles on the right are positioned beneath the superficial muscles.

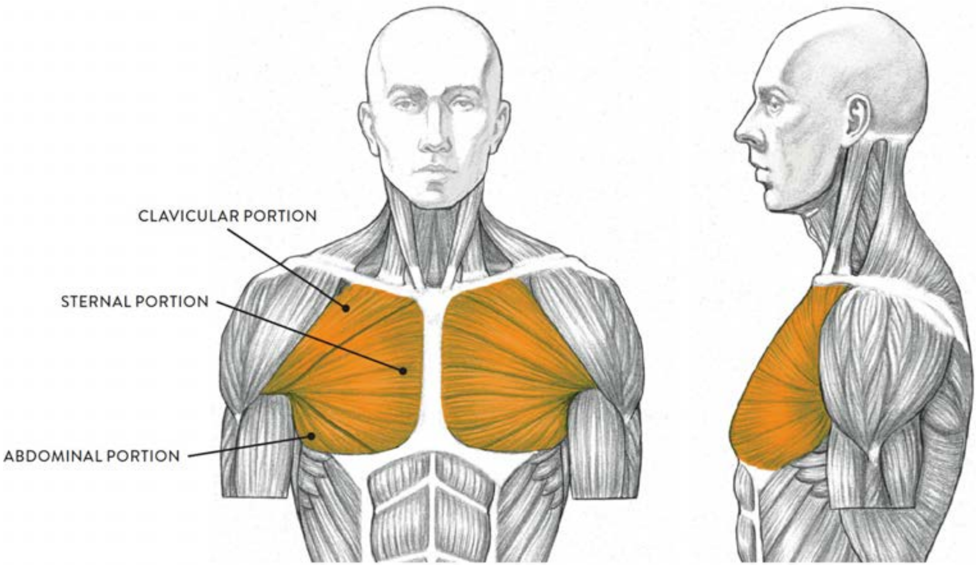


Anterior view

The *pectoralis major* (pron., PECK-tor-AL-liss MAY-jur) is a large, fan-shaped muscle that occupies the anterior region of the rib cage on either side of the sternum. This muscle has three portions: *clavicular, sternal,* and *abdominal.* The pectoralis major forms the anterior wall of the axillary region, or the armpit (see this page), which becomes apparent when the upper arm is positioned away from the torso. The breast form, a combination of glandular and fatty tissue forms, is attached to the fascia (a sheathing layer) that is situated over the pectoralis major muscle.

The clavicular portion begins on the clavicle; the sternal portion begins along the outer side of the sternum; and the abdominal portion begins on a small section of the abdominal sheath. The muscle fibers pull across the rib cage and converge to attach on the humerus (upper arm bone). When the upper arm is lifted away from the torso, the insertion of this muscle is seen more clearly.

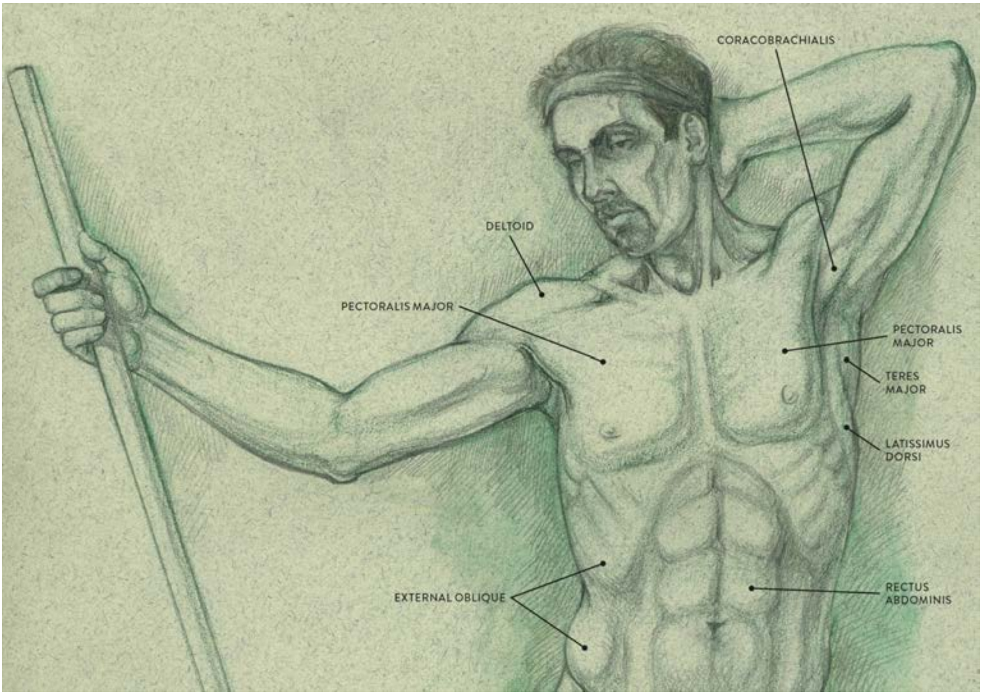
The pectoralis major, shown in the next drawing in both anterior and lateral views, moves the humerus in various ways depending on which portion is contracting and which other muscles are assisting. The main actions are moving the humerus in a forward direction (flexion), moving the humerus from an overhead position and returning it to the side of the torso (adduction), and rotating the humerus in an inward direction (medial rotation).



Torso, anterior (left) and lateral (right) views

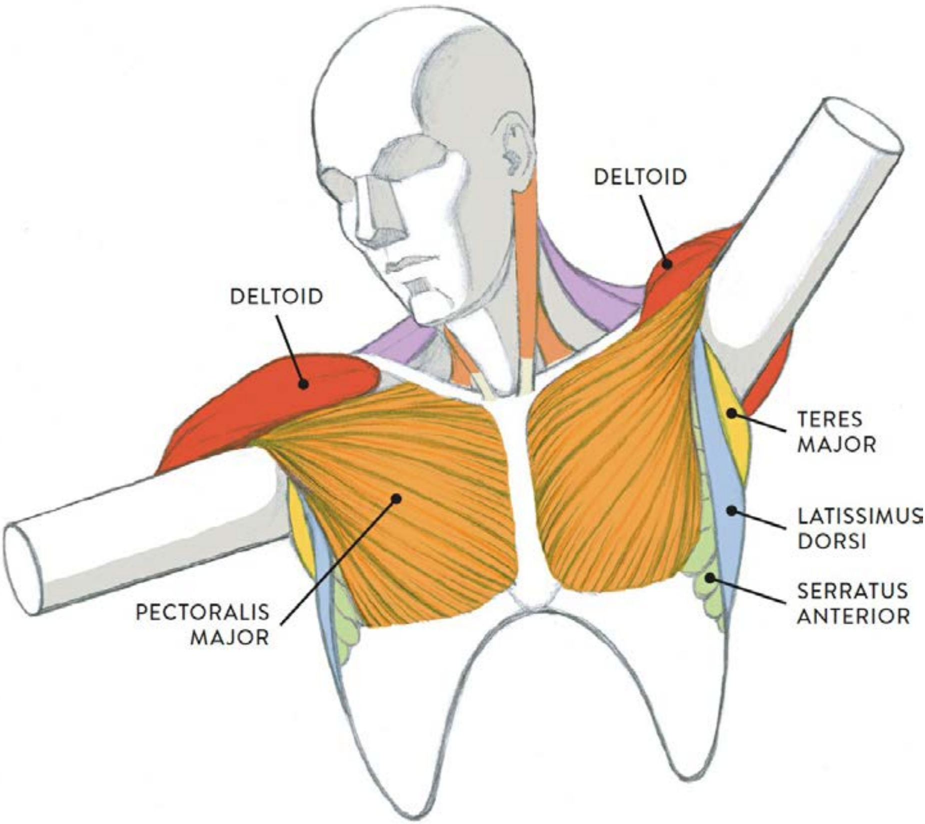
The following life study, *Male Figure Holding a Staff,* focuses on the pectoral area. With the arms positioned away from the torso, it is easy to see how the pectoralis major inserts into the humerus of the upper arm. The thick outer edge is the anterior wall of the axillary (armpit) region. The accompanying diagram reveals the actions of the muscles in this pose.

MALE FIGURE HOLDING A STAFF

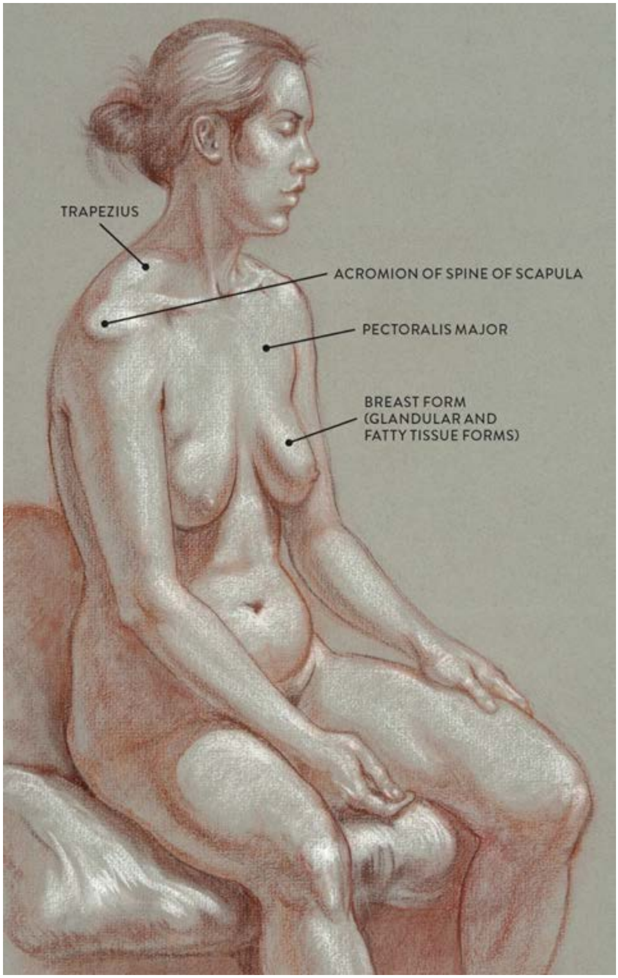


Graphite pencil and watercolor pencil on light toned paper.

MUSCLE DIAGRAM



The next life study *Seated Female Figure,* shows the upper part of the pectoralis major positioned flat against the rib cage, with very little thickness. The soft-tissue forms of the breasts, consisting of glandular tissue (mammary glands) and fatty tissue, are anchored on the fascia sheathing that covers the pectoralis muscle. As the skin pulls over these forms (muscle and soft tissue) it creates a soft transition on the surface from the relative flatness of the upper rib cage to the rich spherical shapes of the breasts.



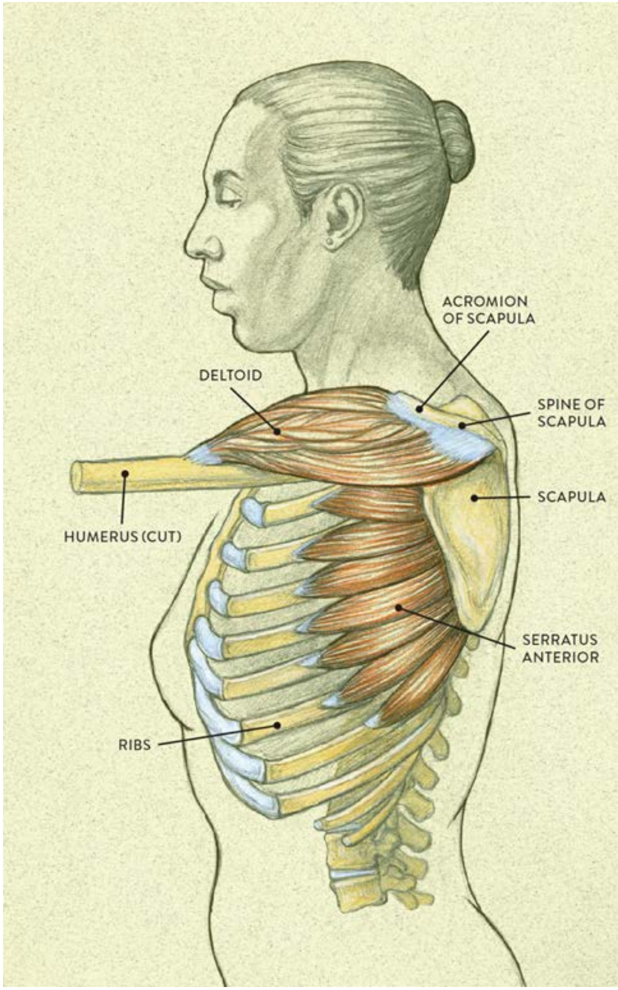
Sanguine and brown pastel pencils and white chalk on toned paper.

The *pectoralis minor* (pron., PECK-tor-AL-liss MY-nor) consists of three muscle strips positioned beneath the pectoralis major. It is usually not detectible on the surface form. Each muscle strip of the pectoralis minor begins on a different rib (ribs 3 through 5). The muscle then inserts into the coracoid process (a small, beaklike bony protrusion) of the scapula. The pectoralis minor helps lower the shoulder blade in the action of depression of the scapula and moves the scapula in a forward direction in the protraction of the scapula.

The *serratus anterior* (pron., sir-RAY-tus an-TEER-ee-or, sir-RAH-tus an-TEER-ee-

or, or SIR-ah-tus an-TEER-ee-or) is a fan-shaped muscle consisting of eight or nine separate muscle digitations (finger-like shapes) located on the lateral region (outer side) of the rib cage. Each of these elongated muscle strips attaches on a separate rib, beginning with the first rib, and wraps around the side of the rib cage to insert into the medial (inner) border of the scapula. The serratus anterior is mostly hidden by the pectoralis major and the latissimus dorsi muscles, but the lower three or four digitations can be visible on the surface, appearing as small, riblike forms between the outer edge of the pectoralis major and the outer edge of the latissimus dorsi.

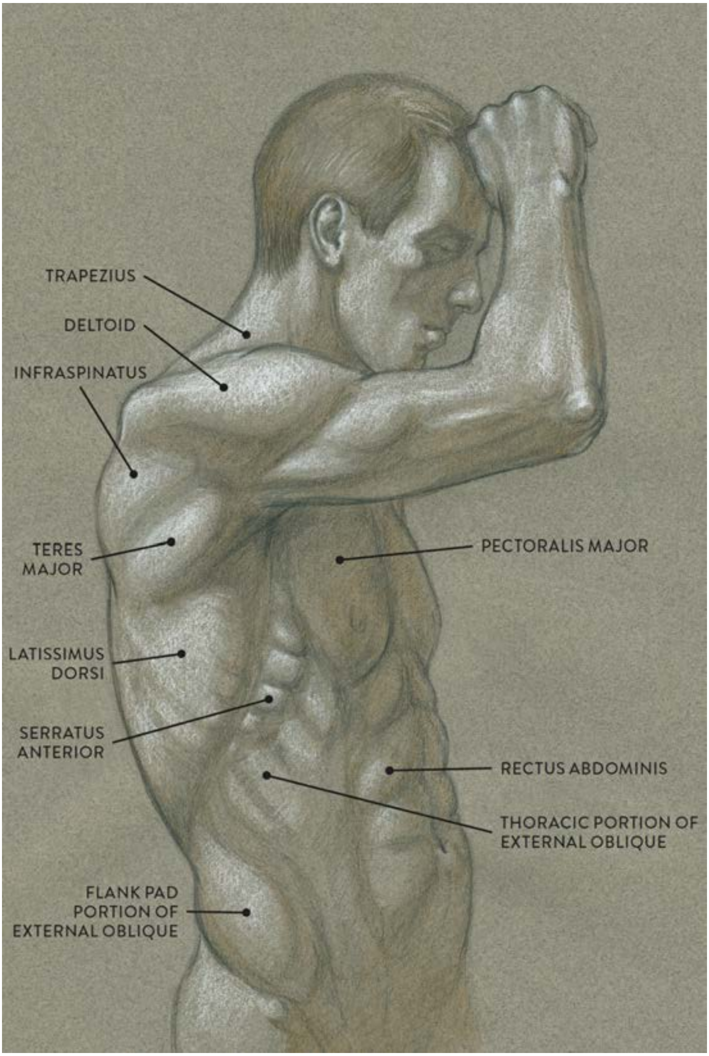
The main actions of the serratus anterior are the protraction and upward rotation of the scapula. Protraction of the scapula is the action of moving the scapula in a forward direction and occurs when the arm is reaching forward in front of the torso, as shown in the following drawing. Upward rotation is the tilting the scapula in a upward direction and occurs when the arm is raised overhead.



Lateral view of torso with humerus lifted in a forward direction

The life study *Male Figure Lifting His Right Arm, Side View,* right, shows a man raising his arm to expose the muscles more clearly. Between the rich outer edge of the latissimus dorsi and pectoralis major appear some small riblike forms that are the partly exposed shapes of the serratus anterior.

MALE FIGURE LIFTING HIS RIGHT ARM—SIDE VIEW



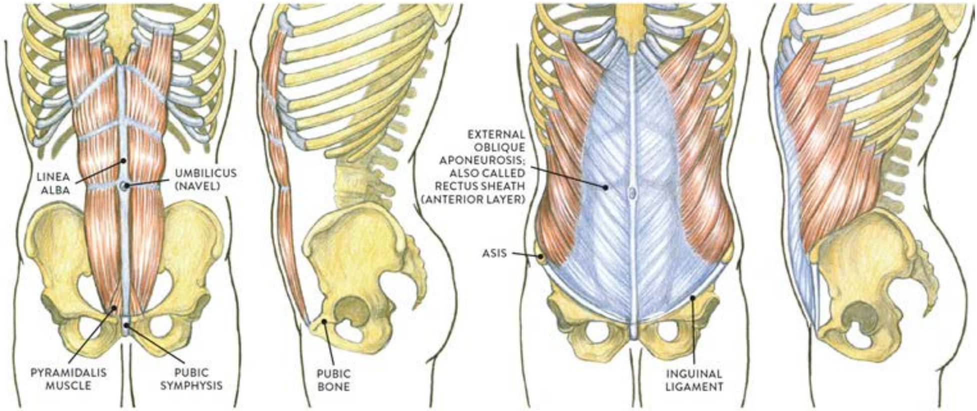
Graphite pencil, watercolor wash, and white chalk on toned paper.

The Abdominal Muscle Group

Occupying the anterior and lateral regions of the abdominal area of the torso are three layers of muscles: The *superficial muscle layer* contains the external oblique and rectus abdominis—the two abdominal muscles seen on the surface form. The *intermediate layer* contains the internal oblique, and the *deep layer* contains the transversus abdominis. The abdominal muscle group helps move the vertebral column and rib cage in the actions of forward bending (flexion), side bending (lateral flexion) and rotation, as well as causing the compression of the abdominal wall. Muscles belonging to each of the layers are shown in the following drawing.

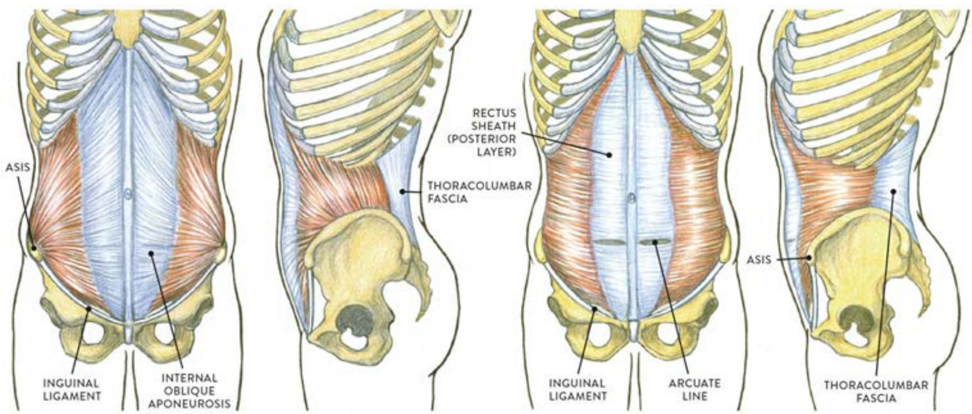
ABDOMINAL MUSCLE GROUP

Anterior and lateral regions of the torso



LEFT: Rectus abdominis (superficial layer)

RIGHT: External oblique (superficial layer)



LEFT: Internal oblique (intermediate layer)

RIGHT: Transversus abdominis (deep layer)

Three abdominal muscles—the transversus abdominis, internal oblique, and external oblique—are layered atop each other on the lateral region of the lower torso; their muscle fibers run in different directions, producing a twisting or swiveling action of the torso when these muscles contract. Each of these muscles has its own large tendinous sheathing that continues across the abdomen to attach into the linea alba—a fibrous

vertical form that attaches from the base of the sternum to the pubic bone of the pelvis. The layered sheathings act as a fibrous sleeve in which the rectus abdominis muscle (located in the anterior region of the lower torso) is encased. When the anterior (front) layer of this sheath is removed, the rectus abdominis muscle is exposed to reveal its eight muscle segments.

The various layers of sheathing of the abdomen have different names, which can cause confusion when studying this region. Adding to the potential difficulty, the anterior layer (positioned over the rectus abdominis muscle) is referred to by several names: the *external oblique aponeurosis,* or the *rectus sheath (anterior layer),* or sometimes the *abdominal sheathing.* The sheathing of the internal oblique is usually called the *internal oblique aponeurosis,* and the sheathing of the tranversus abdominis is called the *rectus sheath (posterior layer),* because it is positioned *beneath* the rectus abdominis muscle.

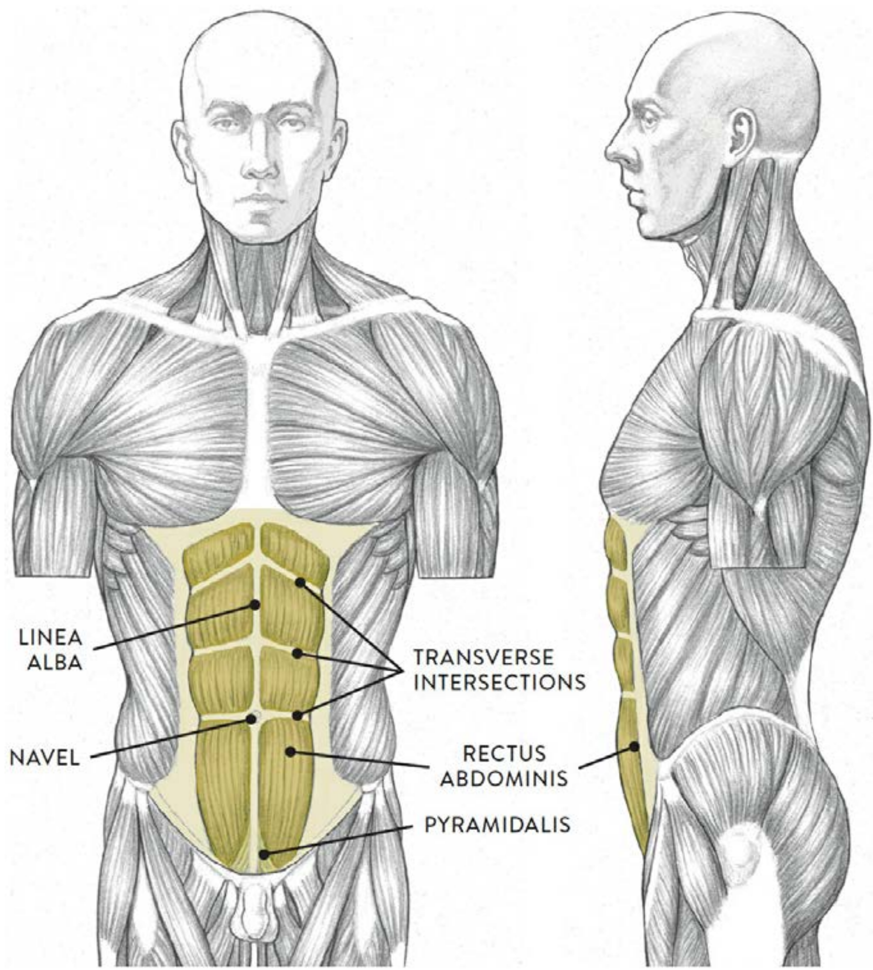
The *rectus abdominis* (pron., RECK-tuss ab-DOM-ih-niss) muscle occupies the front portion of the torso in the abdomen region. The muscle is divided by a vertical fibrous line called the *linea alba* ("white line") and three horizontal fibrous lines called the *transverse* lines. The rectus abdominis is commonly known as the "six-pack," because the muscle is divided into six sections above the navel, which appear as six small forms on the surface of some muscularly defined torsos. Below the navel, the muscle is divided into an additional two segments (more on some individuals), but a layer of fatty tissue usually softens the lower two segments into one shape. Differences between the rectus abdominis as it appears on males and females are examined in the sidebar on this page.

The rectus abdominis begins on the pubic bone and pulls straight up to attach into the xiphoid process of the sternum and the costal cartilages of the fifth, sixth, and seventh ribs. The muscle helps bend the torso forward in the movement known as the *flexion of the vertebral column.* It also helps raise the body from a supine position to an upright sitting position.

The *pyramidalis* (pron., purr-RAM-ah-DAY-liss or PEER-ah-mah-DALL-liss) is a very small triangular muscle located at the base of the rectus abdominis. It is hard to detect on the surface form because its muscle fibers blend with those of the rectus abdominis. The muscle begins on the pubic symphysis of the pelvis and inserts into the lower portion of the linea alba. The pyramidalis does not help move any bones. Its main function is to help tense the linea alba. Both the rectus abdominis and the pyramidalis are shown in the following drawing.

RECTUS ABDOMINIS, WITH PYRAMIDALIS

Superficial layer of abdominal muscle group, anterior region of torso



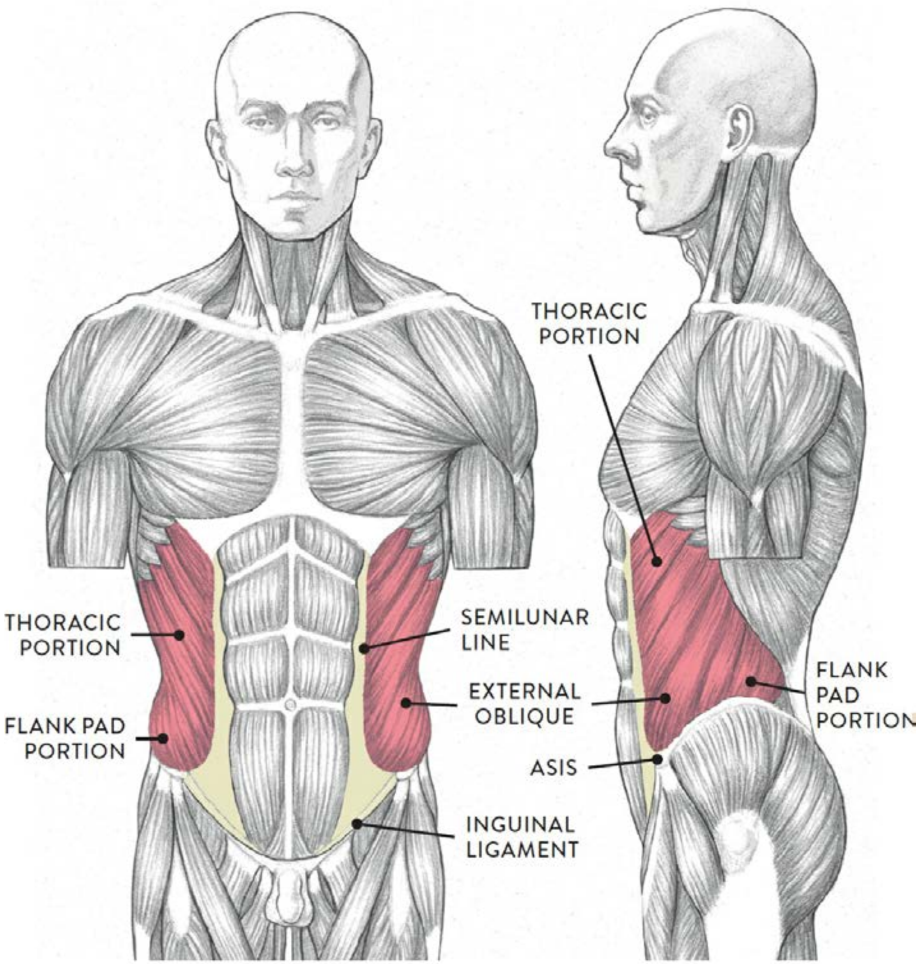
Torso, anterior (left) and lateral (right) views

The *external oblique* (pron., ex-STER-nal oh-BLEEK) is located on the lateral (side) portion of the torso. The muscle consists of eight elongated muscle digitations and is divided into two portions: the *thoracic portion* and the *abdominal portion,* also called the *flank pad.* The thoracic portion hugs the rib cage like a girdle and is hard to detect on the surface except in muscularly defined torsos. The individual muscle strips of the thoracic portion begin on the ribs and appear to interweave with the muscle digitations

of the serratus anterior. The flank pad portion is more noticeable as a bulbous shape beginning below the waistline. At the bottom portion, its muscle fibers anchor along the upper rim of the pelvis (iliac crest), slightly cascading over it near the ASIS of the pelvis. While this is a muscle form, it is usually enhanced with a layer of fatty tissue, giving it a rounded, more prominent shape. Artists use this form as an important landmark in torso studies.

EXTERNAL OBLIQUE

Superficial layer of abdominal muscle group, lateral region of torso

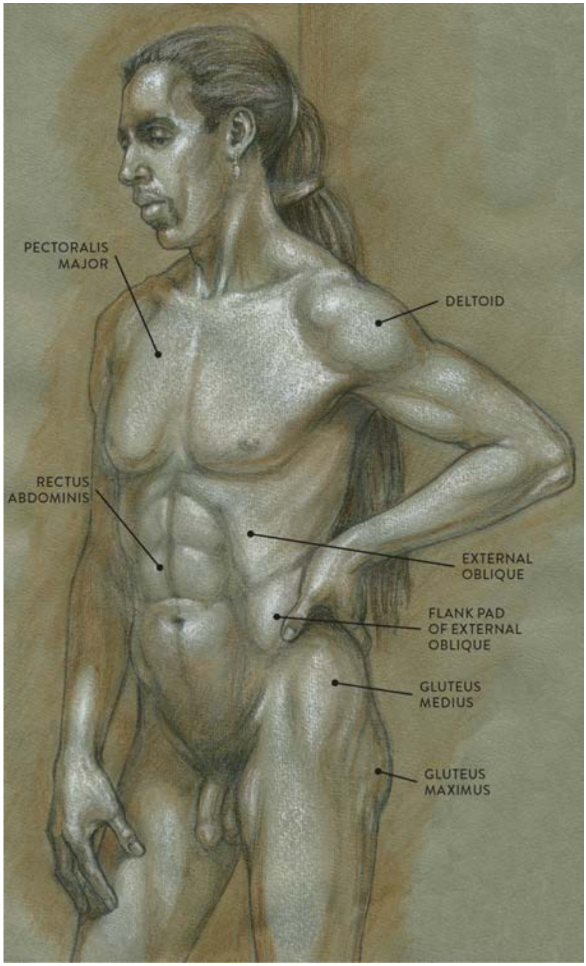


Torso, anterior (left) and lateral (right) views

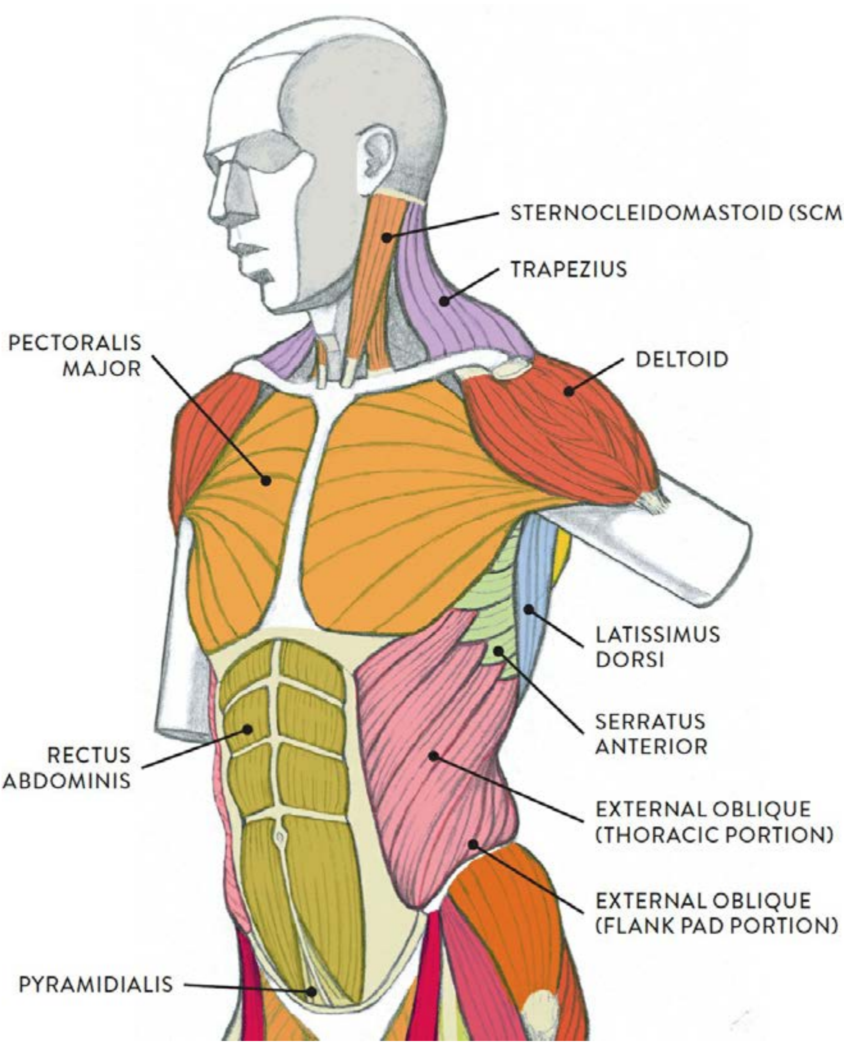
The external oblique begins on the lower eight ribs (ribs 5 through 12) and inserts into the iliac crest of the pelvis, the inguinal ligament, and the aponeurosis of the external oblique and linea alba. When the external oblique contracts, it helps bend the torso in a forward direction (flexion) as well as sideways (lateral flexion). It also helps move the torso in a twisting action (rotation). The flank pad portion can stretch or compress, especially when the torso bends at the side in a dynamic way.

In the life study *Male Figure with Left Hand on Hip,* we see the abdominal region (rectus abdominis and the external oblique), along with the pectoralis major of the thoracic group. The diagram accompanying the drawing reveals the actions of the muscles in this pose.

MALE FIGURE WITH LEFT HAND ON HIP



Graphite pencil, brown ink, watercolor wash, and white chalk on toned paper.

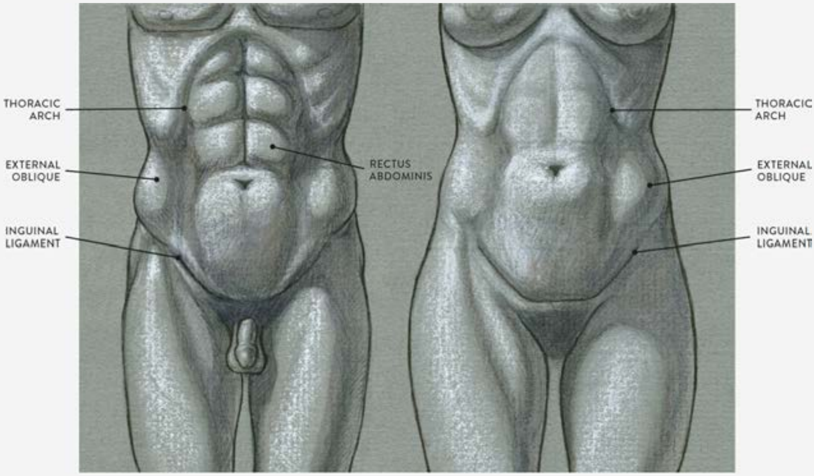


Rectus Abdominis—Male versus Female

The drawings here present idealized versions of male and female torsos. The male torso shows the classic muscle divisions ("six-pack") of the rectus abdominis; the female torso, usually having more subcutaneous tissue, is softer in appearance, with an overall shape similar to that of a violin. There are, however, many variations among real people, male and female. Women who do intensive weight training can develop six-packs, while the rectus abdominis in men can be obscured with excess fatty tissue, creating what is colloquially

known as a beer belly.

DIFFERENCES IN THE ABDOMINAL REGION—MALE AND FEMALE



LEFT: Male torso, anterior view

Muscle shapes are more apparent on the surface

RIGHT: Female torso, anterior view

Muscles are covered with a thicker layer of subcutaneous tissue, softening the surface form

LEFT: A muscular male abdomen is similar to a six-pack.

RIGHT: The female abdomen is generally softer and violin-shaped.

Muscles of the Back

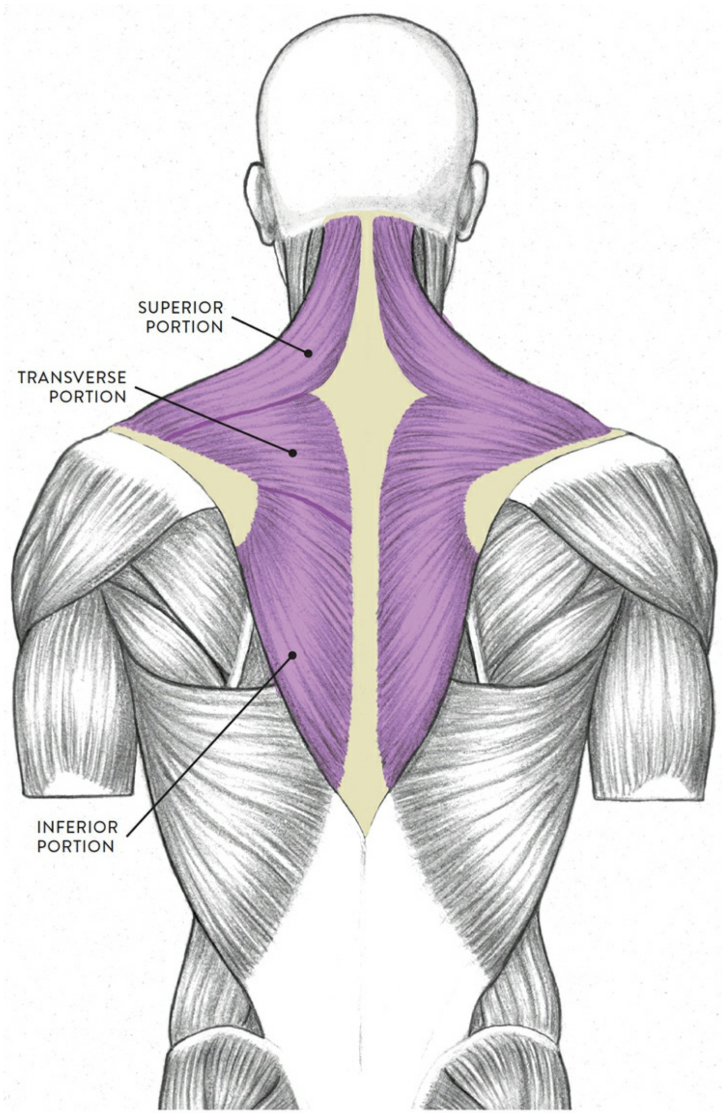
The muscles of the back move the shoulder blade (scapula), upper arm (humerus), and back (vertebral column). They attach along the vertebral column and are divided into three muscle layers: The *superficial layer* contains the trapezius and the latissimus dorsi. The *intermediate layer* contains the rhomboid major, rhomboid minor, and levator scapulae. The *deep layer* contains the sacrospinalis. Muscles of the superficial and intermediate layers are shown in the drawing on this page; the muscles of the scapula and the deltoid muscle are included here but will be introduced separately, later in the chapter.

The Superficial Muscle Layer

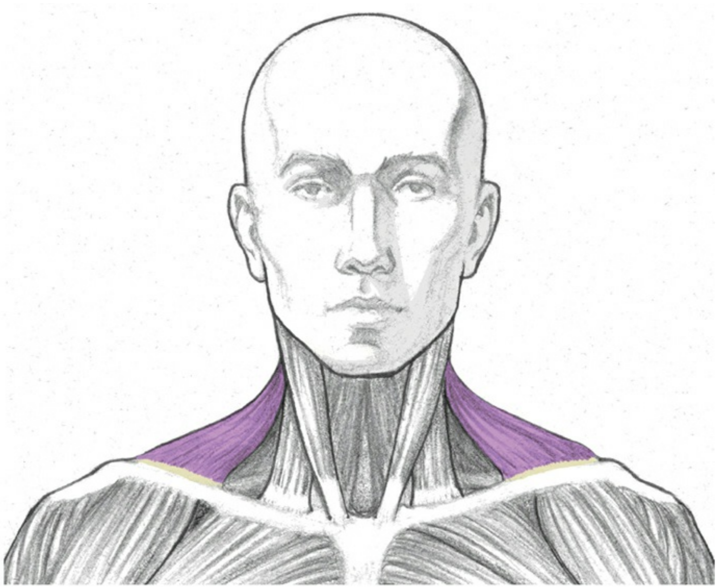
The muscles of the superficial layer of the back move the shoulder blade (scapula) and upper arm (humerus). The two large main muscles of this layer are the trapezius and the latissimus dorsi.

The *trapezius* (pron., traa-PEA-zee-us) is a trapezoid-shaped muscle positioned on the upper back. Its unique shape, shown in the following drawing helps create the shoulder forms, the back of the neck, and the muscle forms of the upper back. Its fibers divide into three portions: the *superior (upper) portion, transverse (middle) portion,* and *inferior (lower) portion.* The muscle originates at the base of the cranium (occipital protuberance), nuchal ligament, C7 (seventh vertebra), and all along the thoracic vertebrae. It inserts into the outer part of the clavicle, the spine of the scapula, and the acromion of the scapula.

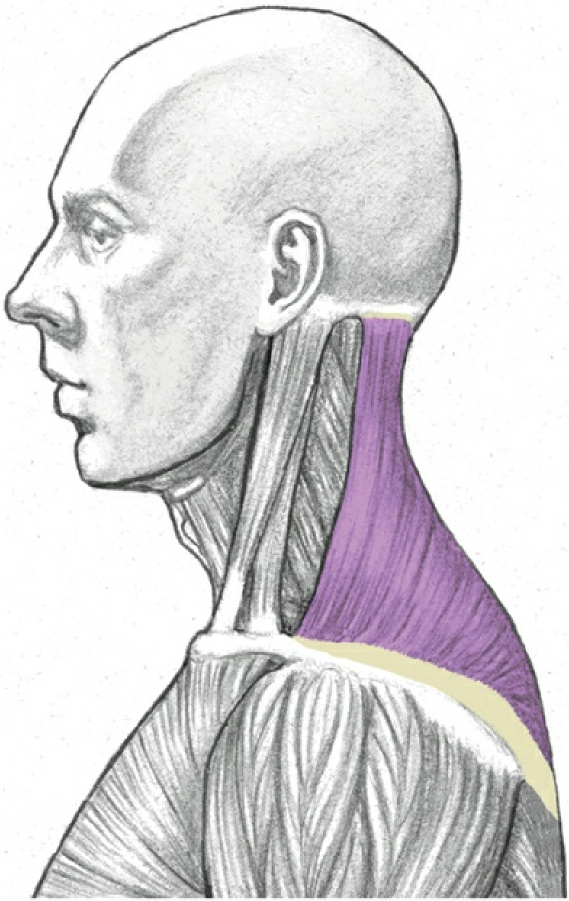
TRAPEZIUS



Posterior view



Anterior view



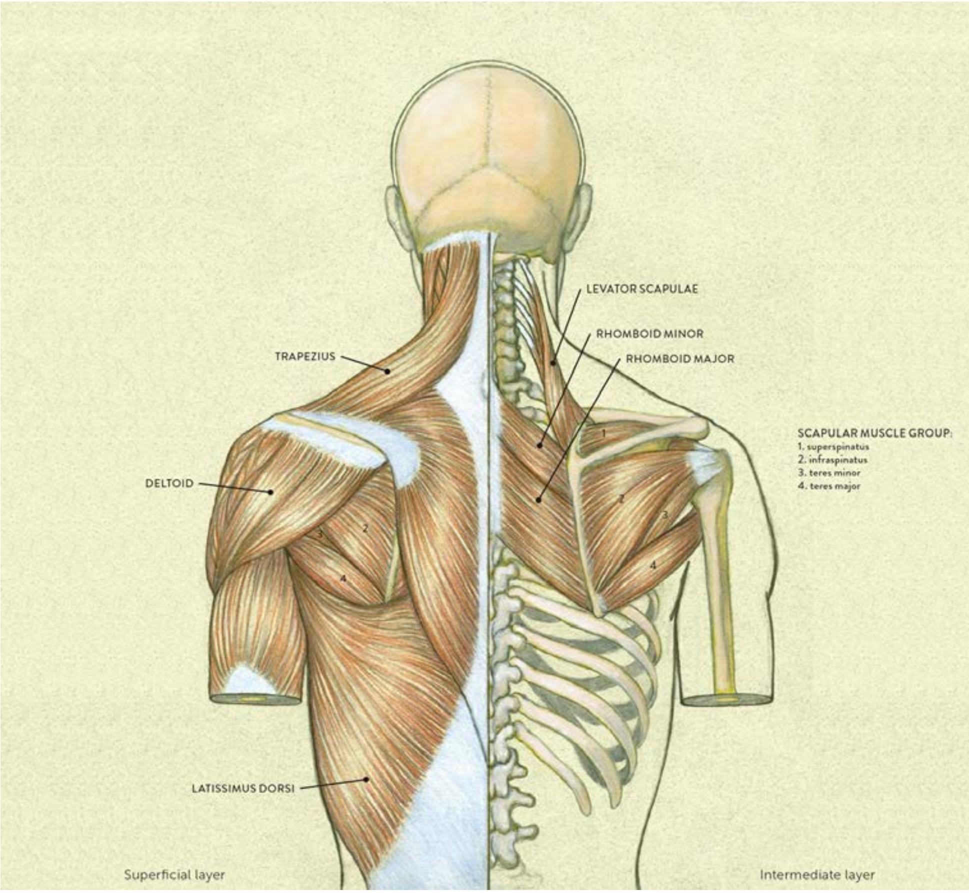
Lateral view

Each portion of the trapezius helps move the scapula in a different way. These actions include lifting the scapula in an upward direction (elevation), tilting the scapula (upward rotation), and moving the scapula back (retraction/adduction). The upper portion of the muscle also helps bend the neck and head backward (extension of the neck).

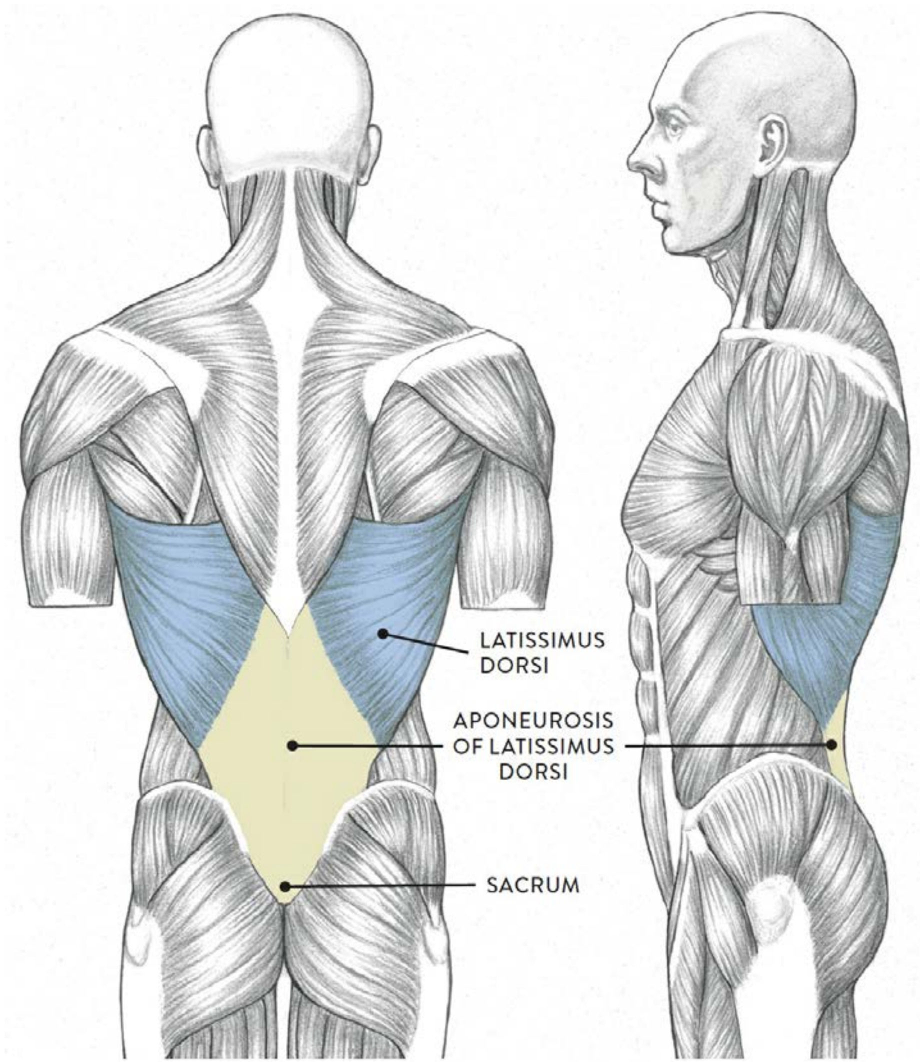
The *latissimus dorsi* (pron., lah-TISS-ih-mus DOR-see or lah-TISS-ih-muss DOR-sigh), shown in the following drawing, is a large triangular muscle that occupies most of the lower back region. On athletic figures (particularly body builders and swimmers) this muscle gives the back of the torso a V-shaped appearance. In a side view, when the arm is pulled forward, the outer edge of the muscle is usually seen as a thick curve obliquely crossing the torso and heading directly into the armpit of the upper arm, forming the posterior wall of the axillar region.

MUSCLES OF THE BACK

Superficial and intermediate muscle layers



LATISSIMUS DORSI



LEFT: Posterior view

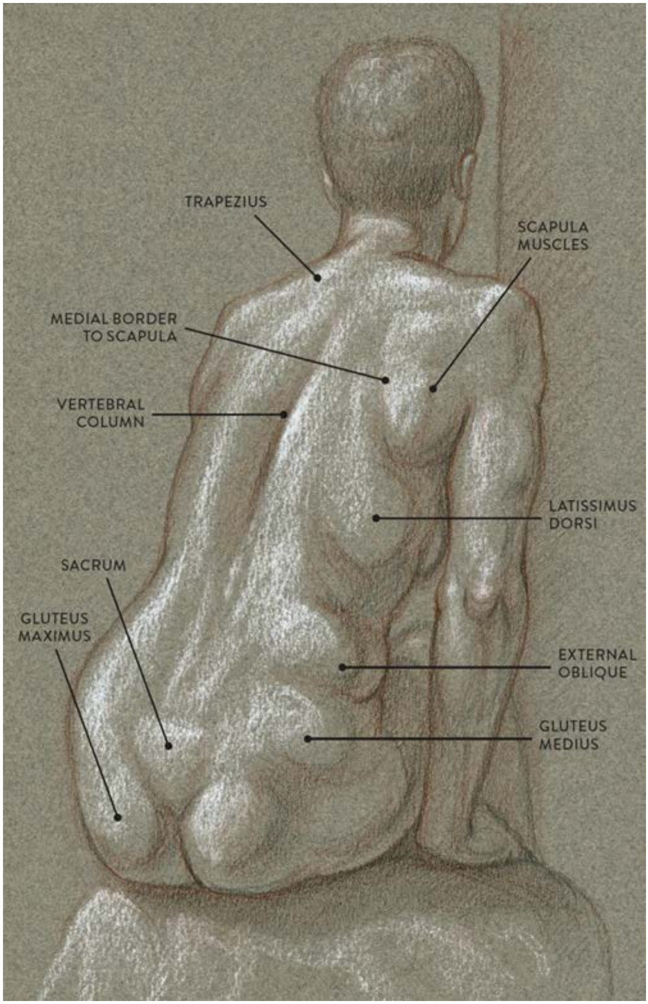
RIGHT: Lateral view

The muscle begins on the thoracic vertebrae (T7–T12) and lumbar vertebrae (L1–L5), the ribs (ribs 10 through 12), the iliac crest of the pelvis, and the sacrum. It inserts into the humerus (upper arm bone). The latissimus dorsi assists in the actions of moving the humerus from a forward position back to the side of the torso (extension), moving the

humerus from an overhead position and returning it to the side of the torso (adduction), and rotating the humerus in an inward direction (medial rotation).

In the life study *Female Figure in a Back View, Leaning Slightly,* the back muscles appear very soft because of a padded layer of superficial fatty tissue. When approaching a study of a figure with a fair amount of fatty tissue, remain aware of the bony structure beneath. Try to find the locations of the vertebral column, sacrum, and scapula bones, because they help divide the back of the torso into workable components and serve as visual landmarks for the placement of muscle forms such as the trapezius, latissimus dorsi, and gluteal group. Once these are placed, the fatty tissue can be emphasized to create softer transitions on the surface form.

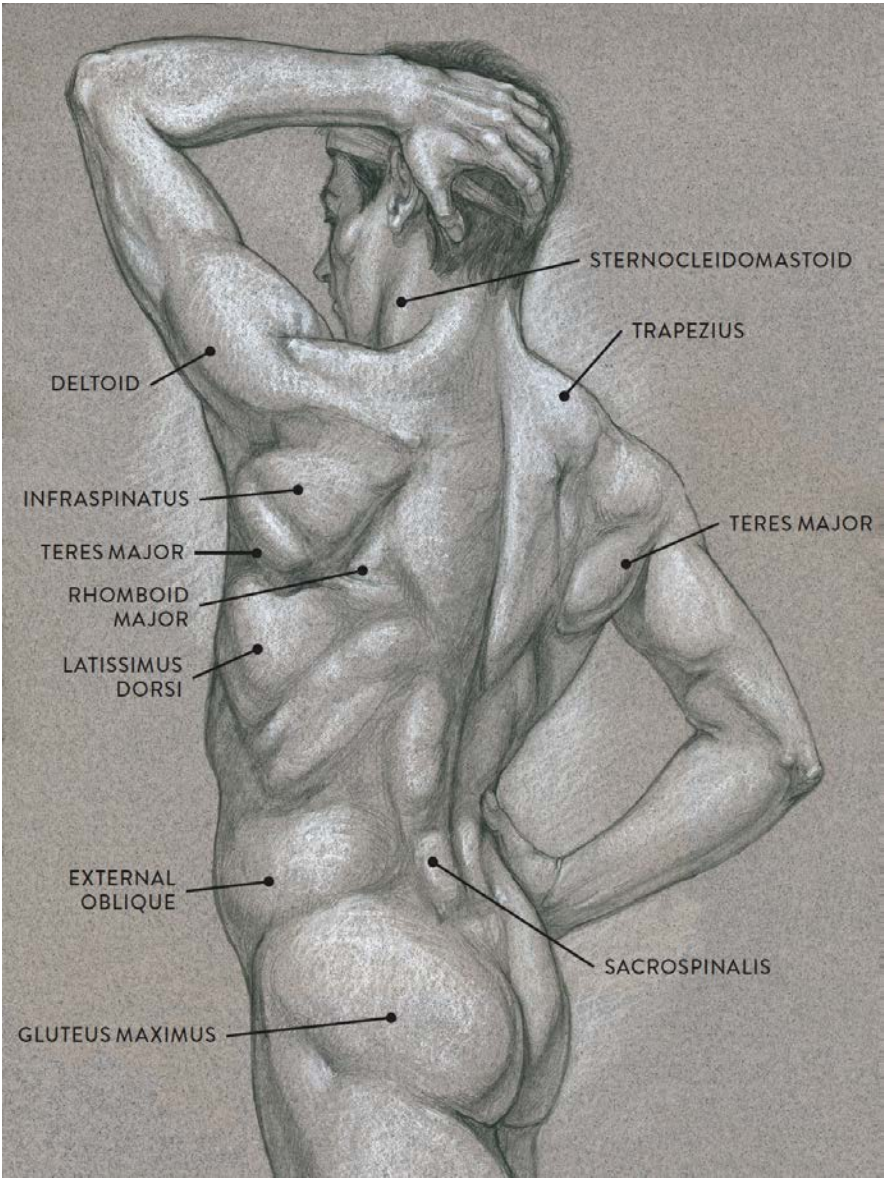
FEMALE FIGURE IN A BACK VIEW, LEANING SLIGHTLY



Graphite pencil, sanguine colored pencil, and white chalk on toned paper.

Now, compare the life study *Male Figure in a Three-quarter Back View,* with the study of the female figure. In this view of a male figure with one arm up and one arm on the hip, there is a tremendous number of clearly defined anatomical shapes, large and small. To avoid confusion when drawing such a muscular figure, first set up the general structures lightly—the shapes of the rib cage and pelvis, head and neck, and arm structures, along with the location of the vertebral column, sacrum, and the scapula bones. Then locate the large muscle shapes of the trapezius, latissimus dorsi, and the

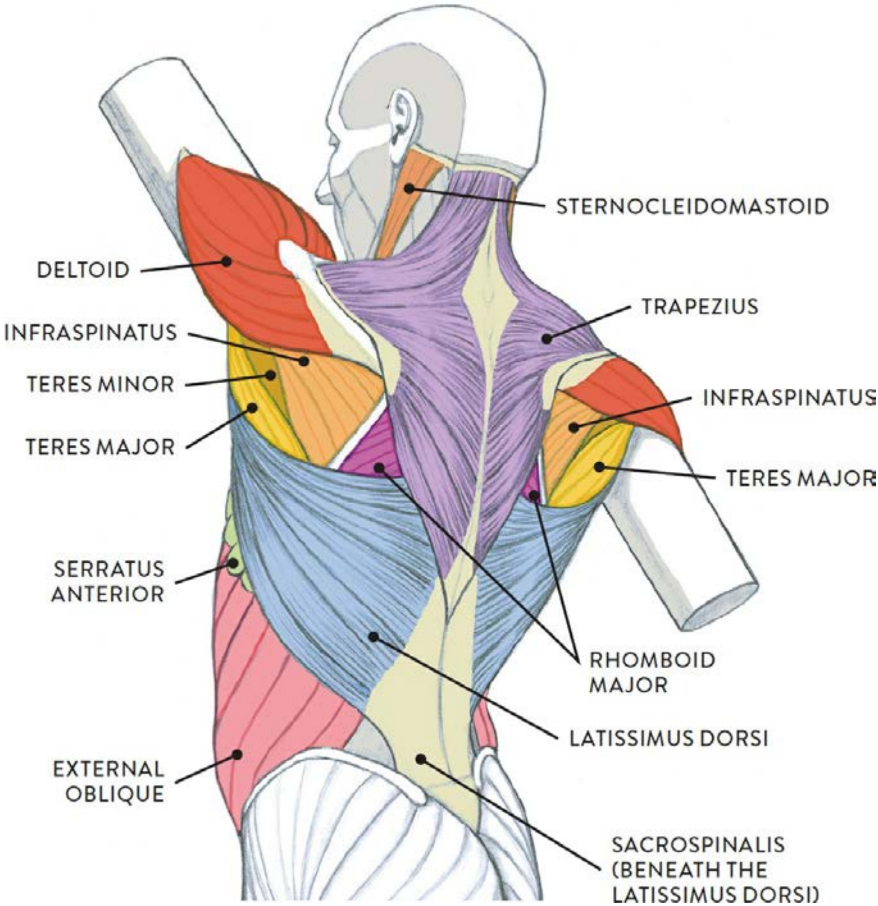
gluteal group. Medium-size forms such as the deltoid, the columnlike forms of the sacrospinalis, the flank pad of the external oblique, and the scapula muscles can be located next. Then go back to each larger muscle and continue to break down the various subforms you may see. Adding the tones and lights as you go helps keep the muscles connected and produces a sense of continuity.



Graphite pencil and white chalk on toned paper.

In poses such as this, you can see how the muscles change shape depending on the action of the arms and the placement of the rib cage and pelvis. The diagram

accompanying the drawing further reveals the actions of the muscles in this pose.



The Intermediate Muscle Layer

The muscles of the intermediate muscle layer of the back are positioned beneath the trapezius and the latissimus dorsi. They include the rhomboid major, rhomboid minor, and levator scapulae and are responsible for helping to move the shoulder blade (scapula) and the upper arm (humerus).

The rhomboid minor and rhomboid major muscles attach between the vertebral column and the inner (medial) border of the scapula. Both are positioned beneath the superficial-layer trapezius muscle. The term *rhomboid* means "diamond shaped," and together the rhomboids form a pair of parallelograms, one on either side of the vertebral

column.

The *rhomboid minor* has a four-sided shape very similar to the geometric figure called a rhombus. The smaller of the two rhomboid muscles, it begins on the seventh vertebra of the neck (C7) and the first thoracic vertebra of the rib cage (T1) and inserts into the vertebral (or medial) border of the scapula.

The larger *rhomboid major* begins on the thoracic vertebrae (T2–T5) and inserts into the vertebral (or medial) border of the scapula. Only a small portion of the rhomboid major is ever visible on the surface, because most of the muscle is covered by the trapezius. It is occasionally evidenced by a small triangular bulge or depression between the outer border of the scapula, the outer lower border of the trapezius, and the upper border of the latissimus dorsi.

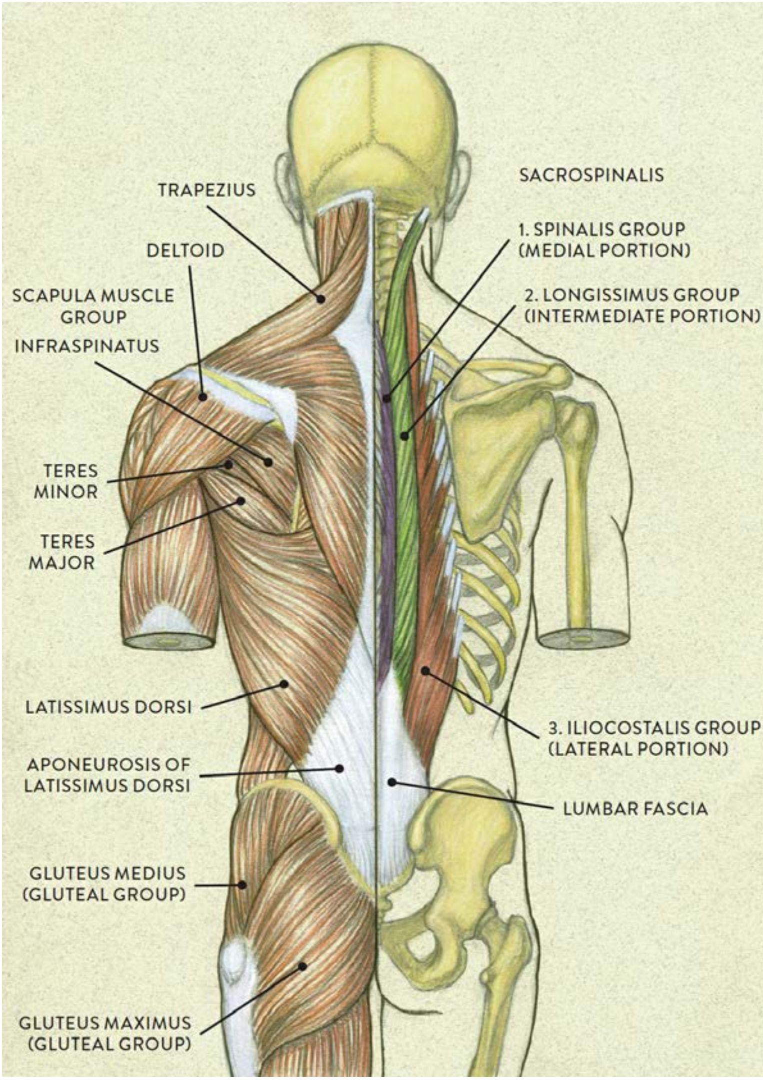
Both the rhomboid major and minor muscles participate in the actions of pulling the scapula toward the vertebral column (protraction/adduction), lifting the scapula in an upward direction (elevation), and tilting the scapula is a downward direction (downward rotation).

The *levator scapulae* (ley-VAY-tor SCAP-yoo-lee) has four individual muscle strips that merge into one muscle mass. It is positioned beneath the upper part of the trapezius muscle. The muscle begins on the first four cervical (neck) vertebrae and inserts into the outer upper edge of the scapula. The levator scapulae participates in moving the scapula in an upward direction (elevation) and tilting the scapula in a downward direction (downward rotation).

The Deep Muscle Layer

Within the deep muscle layer of the back is the *sacrospinalis* (pron., SAY-kro-spih-NAL-iss or SAY-kro-spy-NAY-liss), a large, columnlike muscle that divides into multiple segments. It is positioned beneath the rhomboid muscles of the intermediate layer and the trapezius and latissimus dorsi of the superficial layer. The drawing below shows the position of the sacrospinalis relative to the muscles of the superficial layer.

SUPERFICIAL AND DEEP MUSCLE LAYERS OF THE BACK



Left side: Superficial muscle layer

Right side: Deep muscle layer

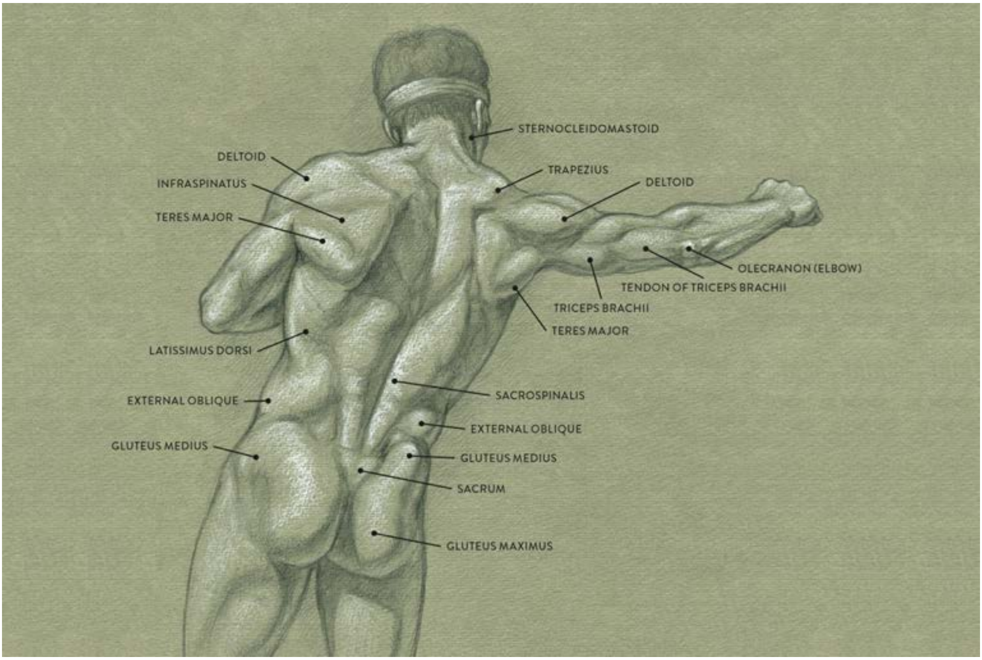
The sacrospinalis, also known as the *erector spinae,* is an incredibly complex muscle. It is divided into three main groups on each side of the vertebral column: the *iliocostalis group* (outer/lateral portion), the *longissimus group* (intermediate/middle portion), and

the *spinalis group* (medial/inner portion). Within each of these groups are further subdivisions. It is difficult to see all these subdivisions on the surface, though on muscular bodies the combination of the many components of this muscle creates two large, columnlike forms on either side of the vertebral column, beneath the latissimus dorsi and trapezius. On bodies with less muscle definition, the lower portion of this muscle appears as two slender cylindrical forms positioned side by side directly above the sacrum.

The muscle originates at the sacrum, all along the lumbar vertebrae (L1–L5), and at the last two thoracic vertebrae (T11–T12). It inserts into the angle of the ribs, along the cervical and thoracic vertebrae, and eventually into the mastoid process of the cranium. The sacrospinalis assists in the actions of moving the vertebral column from a forward-bending position back to an upright position (extension) and of bending the torso back (hyperextension). It also assists in bending the vertebral column and rib cage sideways (lateral flexion) and helps maintain the vertebral column in an upright posture when there is no physical movement (isometric contraction).

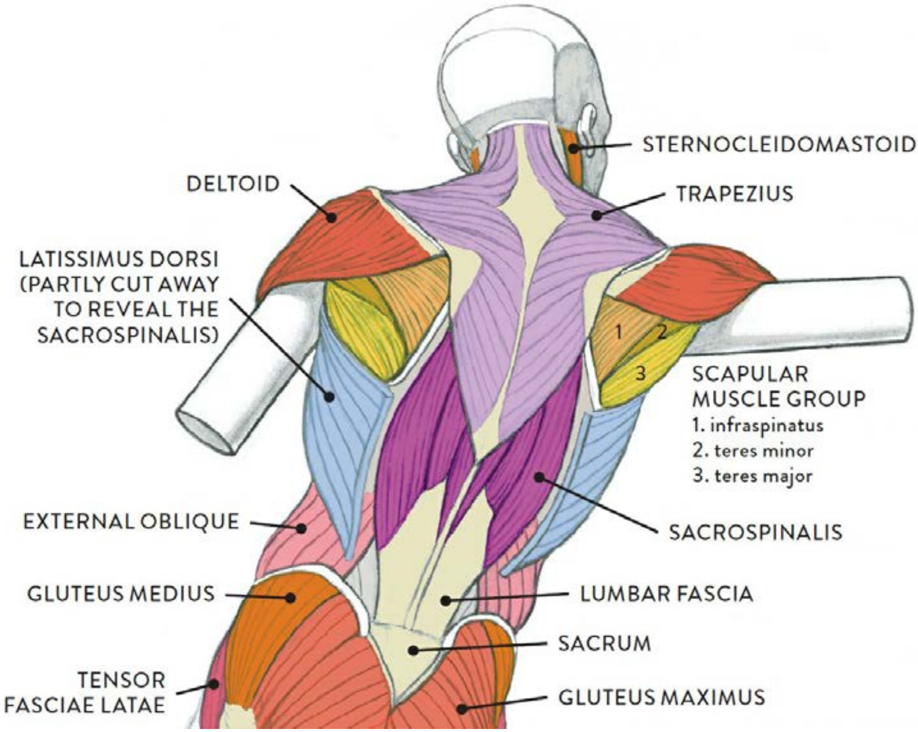
In the life study *Male Figure in a Boxing Pose,* several muscles of the figure's back are very prominent because of their contracted state. The scapular muscle group, sacrospinalis, trapezius, and deltoid are especially noticeable, and the external oblique, latissimus dorsi, as well as the triceps brachii of the right arm are clearly visible, as well. The diagram accompanying the drawing further reveals the actions of the muscles in this pose.

MALE FIGURE IN A BOXING POSE



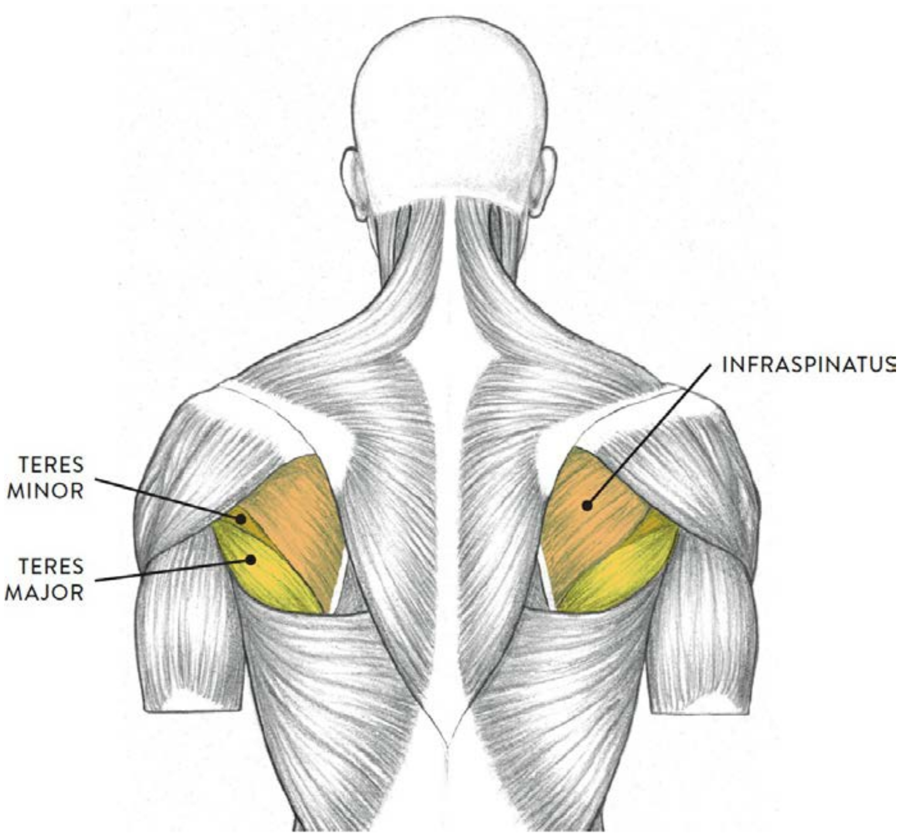
Graphite pencil and white chalk on toned paper.

MUSCLE DIAGRAM



The Scapular Muscle Group

The muscles of the scapular group are the *supraspinatus, subscapularis, infraspinatus, teres major,* and *teres minor*. The supraspinatus is positioned on the upper part of the scapula and is completely covered by part of the trapezius muscle. The subscapularis is attached underneath the scapula and can never be seen on the surface. Therefore only the infraspinatus, teres major, and teres minor are shown in the following drawing.



Torso, posterior view

All these muscles originate on the scapula and insert into the humerus bone of the upper arm. The scapular muscle group does not move the scapula, even though the muscles attach directly on it. Their function is to move the humerus in various directions. Actions include moving the humerus away from the side of the torso (abduction), rotating the humerus in an outward direction (lateral rotation), rotating the humerus in an inward direction (medial rotation), returning the humerus from a outstretched side position to the side of the torso (adduction), and returning the humerus from a forward position back to the side of the torso (extension). Several movements of the upper arm, however, cannot be accomplished without the scapula also moving. This is made possible by another group of muscles, including the trapezius, rhomboid major and minor, levator scapulae, and pectoralis minor.

Scapular Muscle Group	
MUSCLE	**PRONUNCIATION**
supraspinatus	SOO-prah-spih-NAH-tuss or SOO-prah-spy-NAY-tuss
infraspinatus	IN-frah-spih-NAH-tuss or IN-fra-spy-NAY-tuss
teres major	teh-REEZ MAY-jur
teres minor	teh-REEZ MY-nor
subscapularis	SUB-scap-yoo-LAR-iss

The Deltoid

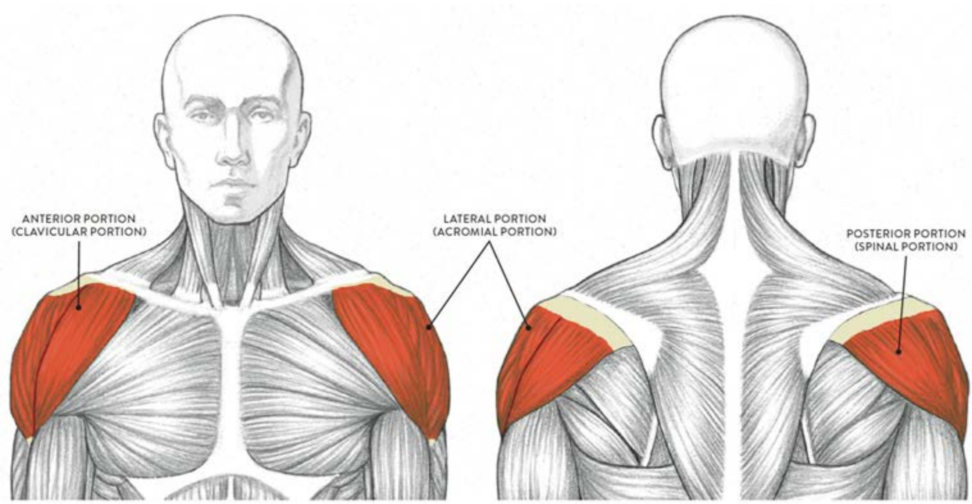
The *deltoid* (pron., DELL-toyd) is the triangular muscle of the shoulder and upper arm. A transitional muscle linking the shoulder girdle of the torso and the upper arm, the deltoid can be said to belong both to the torso muscles and to the upper arm muscles.

The deltoid's shape is similar to that of a sports shoulder pad. Surrounding the vulnerable shoulder joint (glenohumeral joint) of the upper arm and scapula, the muscle appears as a triangular shape in front views and as an inverted teardrop or oval shape in side views of the arm.

The deltoid has three portions: the *anterior portion* (*clavicular portion*), which begins on the clavicle; the *lateral portion* (*acromial portion*), which begins on the acromion process of the scapula; and the *posterior portion* (*spinal portion*), which begins along the spine of the scapula. The muscle fibers converge to insert into a small attachment site approximately halfway down the outer part of the humerus. When the arms are lifted overhead, from a back view it is sometimes possible to see the separation of these portions around the clavicle and the acromion process of the scapula.

The deltoid moves the humerus to different positions depending on which portion is contracting and which other muscles are assisting. Actions include helping move the humerus in a forward direction (flexion), returning the humerus from a flexed position back to the side of the torso (extension), moving the humerus farther back (hyperextension), rotating the humerus in an inward direction (medial rotation), rotating the humerus in an outward direction (lateral rotation), and moving the humerus away from the side of the torso (abduction).

DELTOID



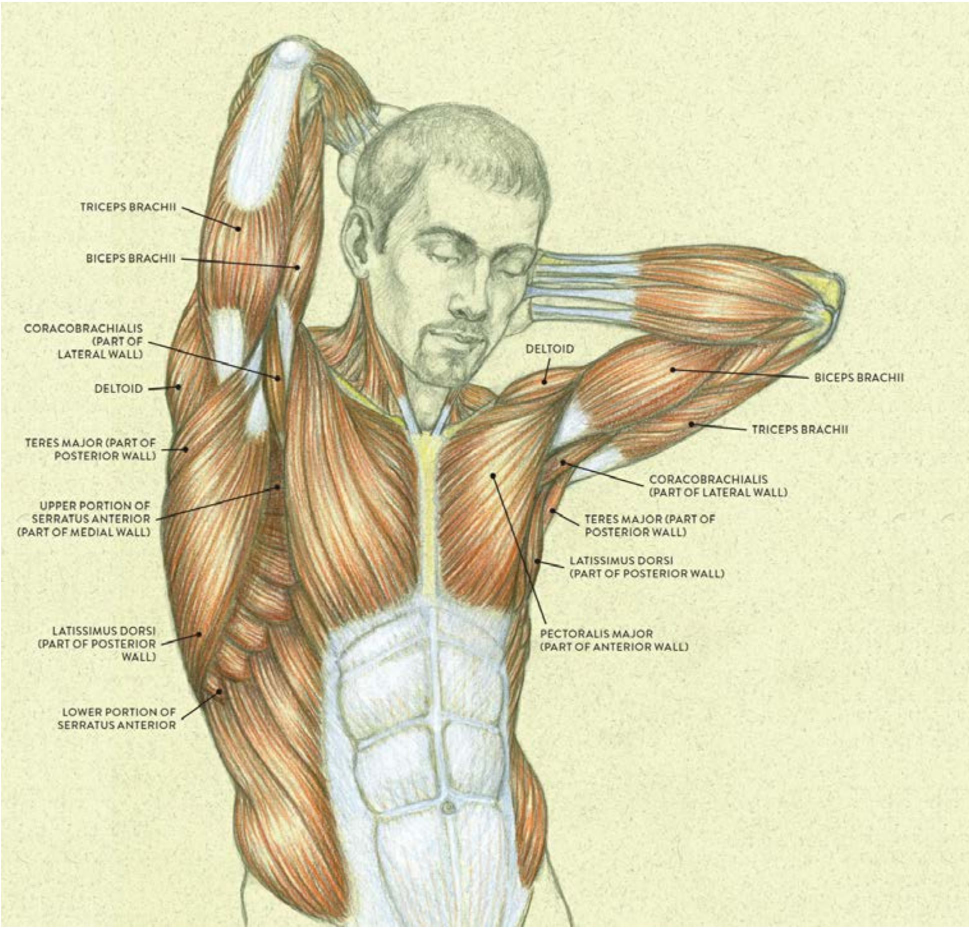
LEFT: Anterior view

RIGHT: Posterior view

The Axilla

The *axilla,* or *axillary region,* is commonly referred to as the *armpit, pit of the arm, or hollow of the arm.* It is a junction of various muscles, softened with connective tissue and fatty tissue (fat pads). The skin pulls across the hollow created by the intersection of muscles as well as the contours of the muscles themselves. The axilla changes shape and size depending on the position of the arm in relation to the torso. When the arm is pulled away from the torso, the fatty tissue within the axilla temporarily recedes and a deep hollow occurs in this region (hence the name *pit of the arm*), but when the arm is raised overhead, the axilla appears as a soft mound.

There are several components of the axillar region, referred to as “walls” of the axilla: the *anterior wall of the axilla,* the *posterior wall of the axilla,* the *medial wall of the axilla,* and the *lateral wall of the axilla.* There is also the *floor of the axilla.* The anterior wall is created by the pectoralis major and pectoralis minor muscles, and is seen on the surface quite clearly as a strong, muscular form moving from the rib cage into the upper arm. The upper portion of the coracobrachialis muscle is concealed by the anterior wall when the arm is at the side of the torso; when the arm is raised overhead, however, it appears as a small elongated form located next to the upper portion of the biceps; this area is the lateral wall. The posterior wall is formed by the teres major and latissimus dorsi muscles, along with the subscapularis muscle beneath. The medial wall consists of the upper four ribs and the upper four digitations of the serratus anterior muscle. The floor of the axilla consists of the axillar fascia and the skin stretching between the anterior and posterior walls. When the arms are pulled up or away from the torso, you can usually detect only the anterior and posterior walls, as well as the floor of the axilla. The coracobrachialis and a few of the fingerlike digitations of the serratus anterior located between the more obvious anterior and posterior walls may also be detected on the surface.



Superficial muscle layer

STUDY OF THREE ARMS

Graphite pencil, ballpoint pen, colored pencil, and white chalk on toned paper.

Chapter 6

Muscles of the Arm and Hand

The muscles of the torso, examined in the previous chapter, include a few that attach directly into the upper arm and help move the humerus at the shoulder joint. In this chapter we will look at the other arm muscles as well as the muscles of the hands, seeing how they move the lower arm at the elbow joint, the hand at the wrist joint, and the fingers and thumb at the interphalangeal (IP) joints.

Some figures' arms are fairly easy to depict, but others' arms are more challenging. "Average" arms, which are basically cylindrical, streamlined structures, are relatively simple. In these arms, most muscles are inconspicuous because they are covered by a subcutaneous layer of fatty tissue, softening the surface form. A few muscles—the deltoid, biceps, triceps, and brachioradialis—may, however, exhibit interesting shapes even on nonmuscular arms, altering shape in various arm movements.

By contrast, the arms of a person with an athletic build have many well-defined muscular bulges and ridges. One potential difficulty in depicting a muscular arm has to do with the spiraling of muscle forms that occurs when the lower arm twists, which may cause confusion about what you are seeing on the surface form.

There are, however, ways to identify the basic muscles within specific arm regions using bony landmarks as guides. And learning the locations of the muscles of the upper and lower arm in a systematic way, as well as their roles in movement, will improve the accuracy of your depictions.

To comprehend the vast complexity of the arm region, anatomists organize arm muscles into groups. There are several ways to do this. Some texts categorize arm muscles according to which body parts they move: *muscles that move the forearm, muscles that move the wrist,* and so on. A variation of this is to group the muscles according to the roles they generally play in movement: *flexors, extensors, pronators, supinators, abductors,* and *adductors.*

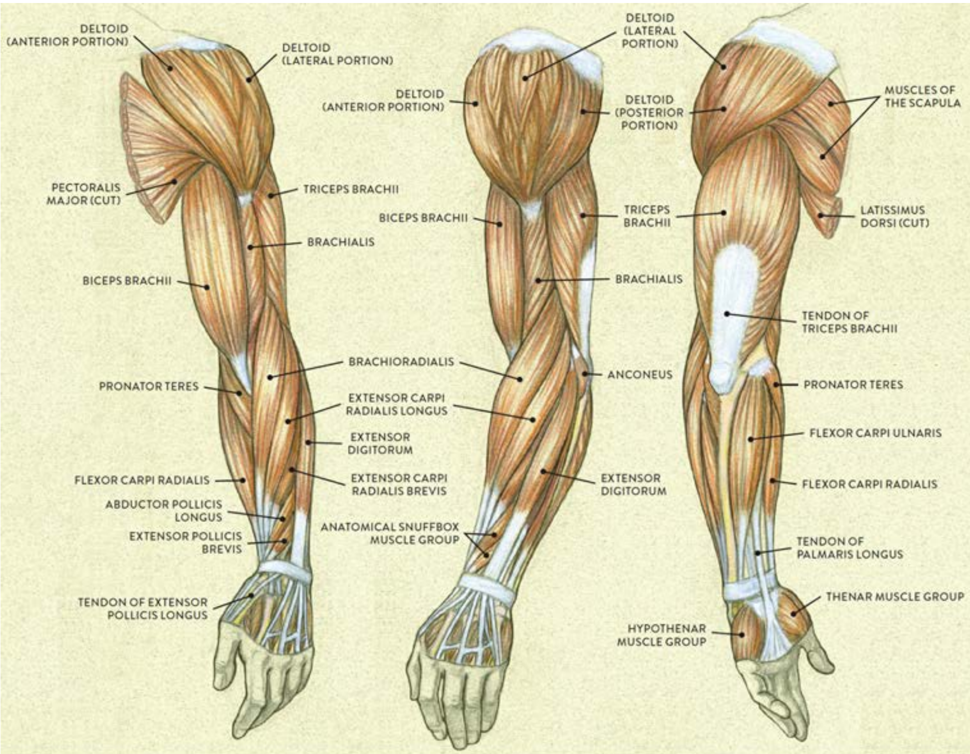
Arm muscles can also be classified by their compartments or regions. Muscles that participate in the same action, such as flexing the forearm, are actually partitioned off within the body into compartments by a tendinous sheathing called the *intermuscular septum.* Each of these various compartments is related to a certain region of the arm—anterior, posterior, medial, or lateral—which helps clarify its general location.

Yet another way to categorize arm muscles is to group them according to their

relationship to the surface. The muscles closest to the surface belong to the *superficial muscle layer.* If a region has more than one muscle layer, muscles farther from the surface may be identified as belonging to the *intermediate muscle layer* or the *deep muscle layer.*

In this chapter, I use a combination of such systems, identifying muscle groups by the regions they occupy, the actions they perform, and the layers in which they are positioned. The drawings here provide a visual overview of the muscles and muscle groups of the entire arm as seen from various views. (Note that the deltoid muscle was covered at the end of the previous chapter.)

MUSCLES OF THE UPPER AND LOWER ARM



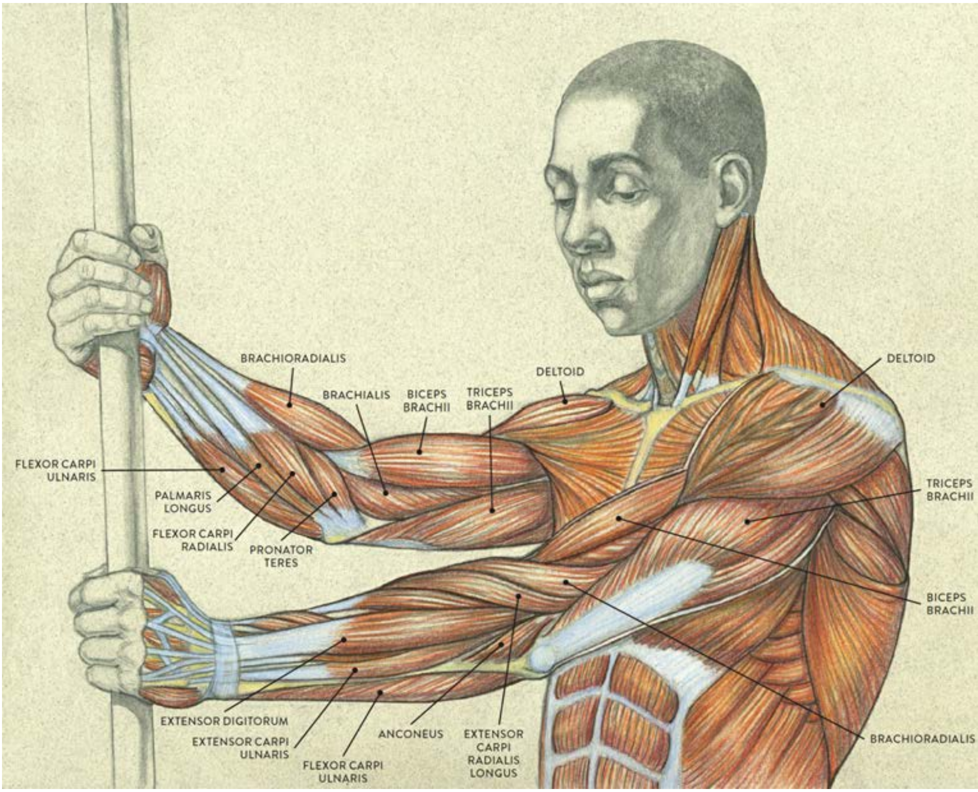
Left arm

LEFT: Anterior three-quarter view

CENTER: Lateral view

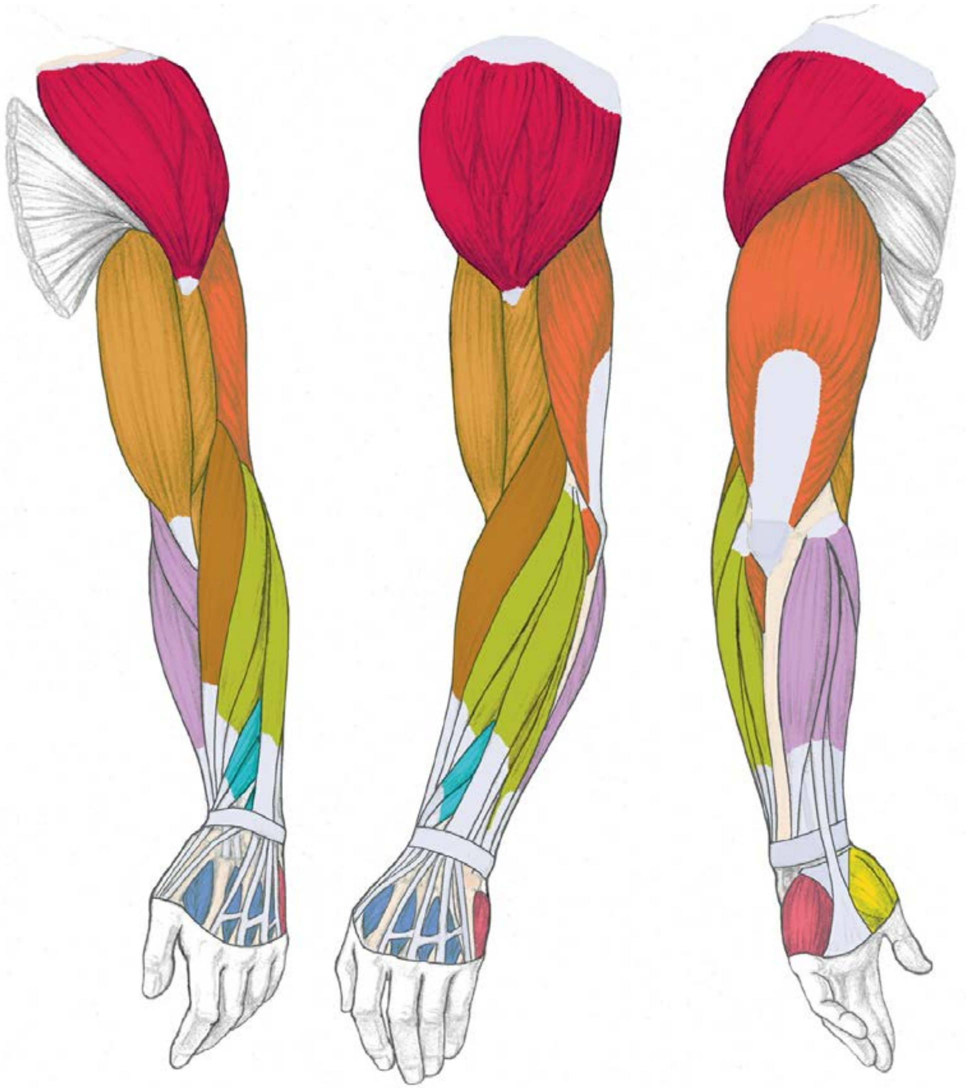
RIGHT: Posterior three quarter view

MUSCLES OF THE UPPER AND LOWER ARM



Upper torso, three-quarter view

MUSCLE GROUPS OF THE UPPER AND LOWER ARM, INCLUDING HAND



Left arm

LEFT: Anterior three-quarter view

CENTER: Lateral view

RIGHT: Posterior three quarter view

MUSCLES AND MUSCLE GROUPS OF THE UPPER AND LOWER ARM

DELTOID MUSCLE

FLEXOR MUSCLE GROUP OF UPPER ARM

EXTENSOR MUSCLE GROUP OF UPPER ARM

BRACHIORADIALIS (PART OF RADIAL MUSCLE GROUP)

EXTENSOR MUSCLE GROUP OF LOWER ARM (SUPERFICIAL LAYER)

FLEXOR MUSCLE GROUP OF LOWER ARM

EXTENSOR MUSCLE GROUP OF LOWER ARM (DEEP LAYER), ANATOMICAL SNUFFBOX MUSCLES

MUSCLE GROUPS OF THE HAND

THENAR MUSCLE GROUP

HYPOTHENAR MUSCLE GROUP

DORSAL INTEROSSEOUS MUSCLE GROUP

Muscle Groups of the Upper Arm

We begin our closer examination with the muscles of the upper arm by dividing them into two basic groups: the *flexor muscle group,* located on the anterior region of the upper arm, and the *extensor muscle group,* located on the posterior region.

Names of Arm and Hand Muscles

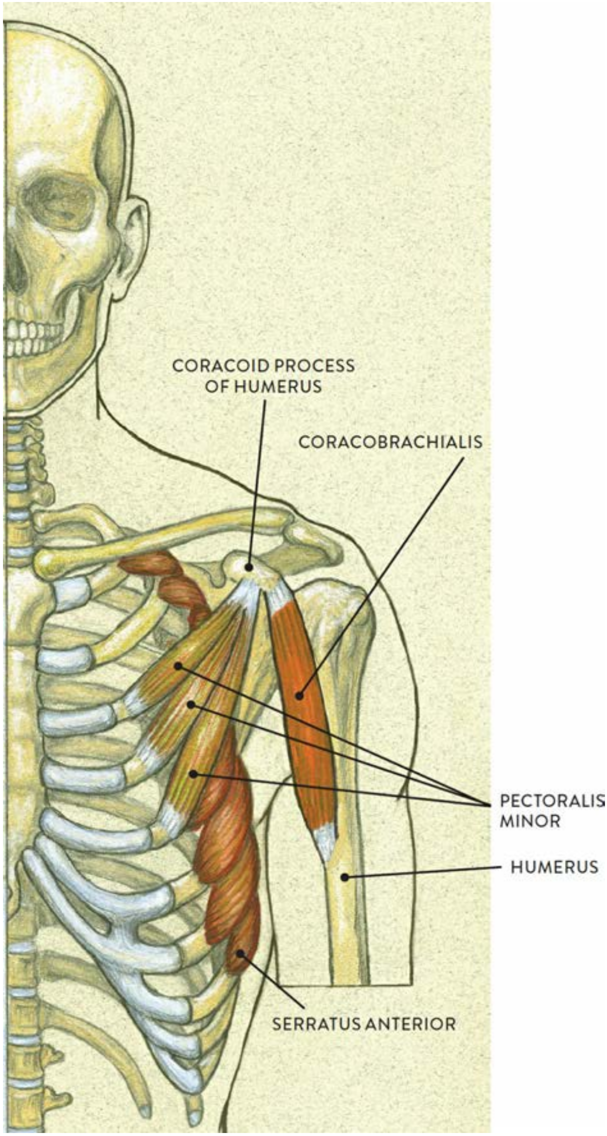
The names of arm and hand muscles provide clues to their location, function, or size.

- *Brachialis, brachio,* and *brachii* pertain to the upper arm.
- *Carpi* pertains to the carpal bones of the wrist.
- *Coraco* pertains to the coracoid process of the scapula.
- *Digitorum* and *digiti* pertain to the fingers (digits).
- *Dorsal* pertains to the back of the hand.
- *Interosseous* means "between bones."
- *Palmar* and *palmaris* pertain to the palm side of the hand.
- *Pollicis* pertains to the thumb.
- *Radialis* pertains to the radius bone of the lower arm.
- *Ulnaris* pertains to the ulna bone of the lower arm.
- *Abductor* pertains to moving a body part away from the midline.
- *Adductor* pertains to moving a body part back toward the midline.
- *Extensor* pertains to stretching.
- *Flexor* pertains to bending.
- *Brevis* means "short."
- *Longus* means "long."
- *Minimi* means "little."
- *Profundus* means "deep."

The Flexor Muscle Group of the Upper Arm

The flexor group of the upper arm is positioned on the anterior region of the humerus.

Muscles belonging to this group are the biceps brachii, brachialis, and coracobrachialis. The biceps brachii is the most prominent, taking up most of the front of the upper arm region. The brachalis is mainly hidden by other muscles, with only a small area seen on the surface. The coracobrachialis, positioned behind the biceps brachii, can only be seen when the arm is lifted overhead. The biceps brachii and brachialis appear in the drawing opposite; the coracobrachialis is shown separately, in the following drawing.



Skeletal torso, anterior view

The *biceps brachii* (pron., BI-seps BRAY-kee-ee or BI-seps BRAKE-ee-eye) is a two-headed fusiform muscle located on the front region of the upper arm, or humerus. Elongated when relaxed, the biceps brachii changes shape when its muscle fibers

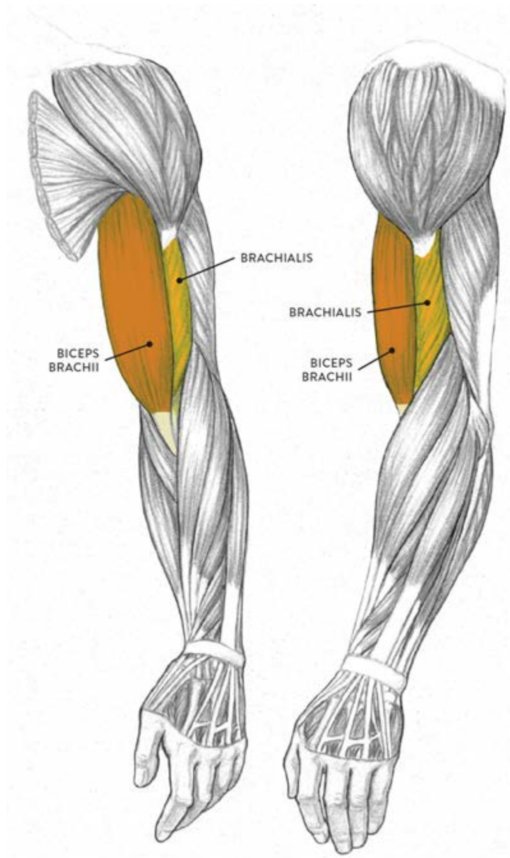
contract, becoming tightly compact. On muscularly defined arms, the biceps looks like a small melon when contracted.

The *long head* of the muscle begins on the scapula above the glenoid fossa at the supraglenoid tubercle, which is a small projection of bone. The *short head* begins on the coracoid process of the scapula. At the other end of the biceps brachii is a single tendon, which attaches on the radius bone of the lower arm on a small protrusion called the radial tuberosity. The biceps brachii moves the lower arm toward the upper arm from the elbow joint (flexion) and also rotates the lower arm from the elbow joint (supination).

The *brachialis* (pron., BRAY-kee-al-iss or bray-kee-AA-liss) is a slightly flattened fusiform muscle mostly covered by the biceps brachii. On an average arm the brachialis is hard to detect, but on a muscularly defined arm the muscle can been seen as a slight bulge between the triceps and the biceps. The brachialis begins on the lower half of the humerus and inserts into the coronoid process of the ulna. The muscle assists the biceps brachii in bending the forearm toward the upper arm from the elbow joint (flexion).

The *coracobrachialis* (pron., KOR-ah-ko-BRAY-kee-al-iss) is a small elongated fusiform muscle positioned beneath the biceps brachii of the upper arm. The muscle can only be seen on the surface when the upper arm is raised overhead, appearing as small ridgelike form next to the short head of the biceps brachii in the armpit region. The muscle begins on the coracoid process, a small bony projection, shaped like a bird’s beak, on the scapula. It then inserts into the medial side of the humerus. The coracobrachialis helps bend the humerus (flexion), rotates the humerus in an inward direction (medial rotation), and brings the abducted humerus back to its normal location (adduction).

FLEXOR MUSCLE GROUP OF THE UPPER ARM



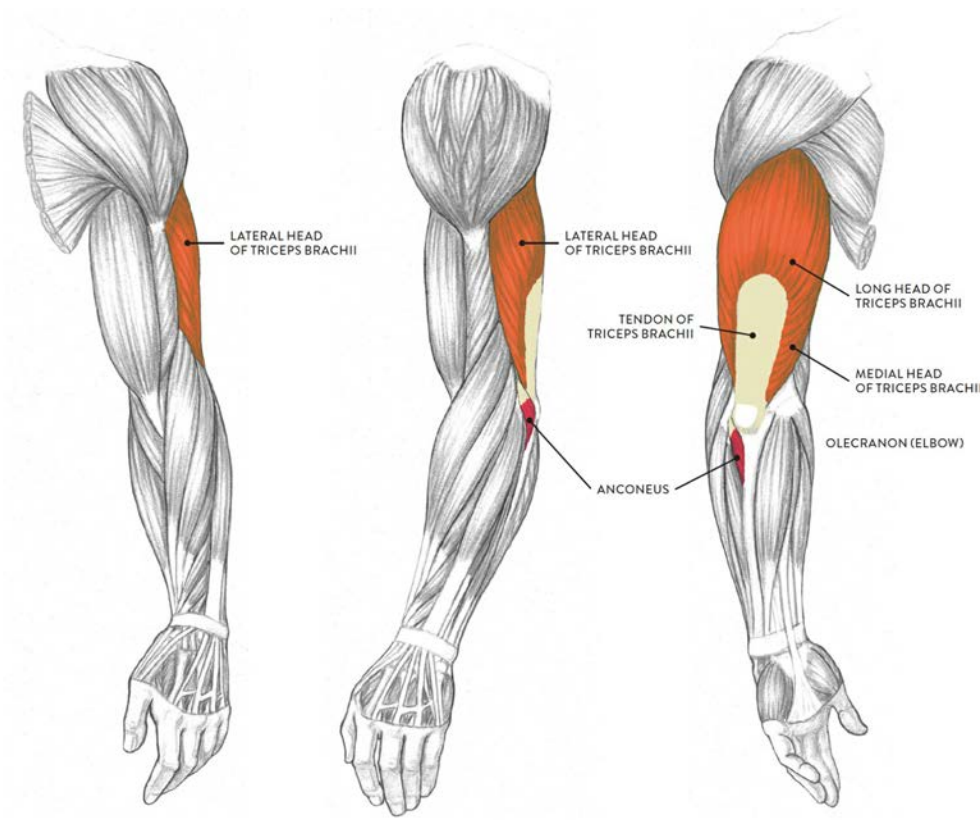
Left upper and lower arm

LEFT: Anterior three-quarter view

RIGHT: Lateral view

The Extensor Muscle Group of the Upper Arm

The two muscles of the extensor group of the upper arm are the triceps brachii and the anconeus, as shown in the following drawing. The triceps brachii is located on the posterior region of the upper arm, while the anconeus is located on the posterior region of the lower arm, near the elbow. They help straighten the lower arm (ulna) from a flexed or bent position.



Left upper and lower arm

LEFT: Anterior three-quarter view

CENTER: Lateral view

RIGHT: Posterior three-quarter view

The *triceps brachii* (pron., TRI-seps BRAY-kee-ee or TRI-seps BRAKE-ee-eye) is a large three-headed muscle occupying most of the posterior aspect of the upper arm. The three heads are the *lateral (outer) head,* the *long head,* and the *medial (inner) head.* If the triceps of the upper arm is significantly developed, a fleshy horseshoe shape will appear on the surface when the muscle contracts—the combined shapes of the heads surrounding the neutral tendon. If the muscle is not well developed, then the back of the relaxed upper arm registers as a cylindrical shape, with very little indication of the triceps heads. On an “average” upper arm, the outer head and long head will appear as

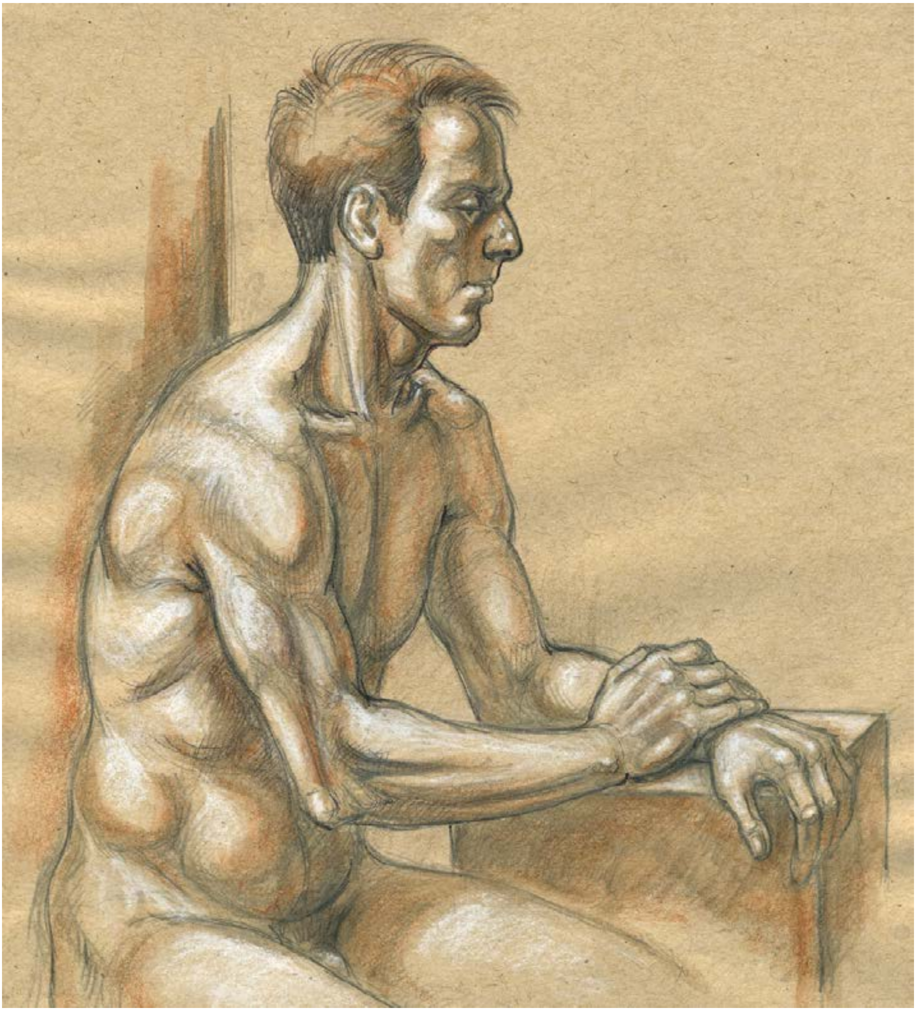
two bulges on the surface form only when the muscle is contracting.

The lateral head of the triceps brachii begins on the posterior and lateral surfaces of the humerus. The medial head begins on the posterior and medial surfaces of the humerus. The long head begins on the scapula below the glenoid fossa at a small triangular region called the infraglenoid tubercle. The muscle fibers of all three heads merge into a large flat tendon that inserts into the olecranon process (elbow) of the ulna. The triceps brachii straightens the lower arm at the elbow joint (extension). The long head assists in the action of adduction of the humerus, which is moving an abducted humerus back to the side of the body.

The *anconeus* (an-KOH-nee-us) is a small triangular muscle located between the olecranon (elbow) of the ulna and the radial muscle group. Its fleshy mass is at times noticeable on the surface, depending on the position of the arm. The muscle begins on the humerus, at the lateral epicondyle, and inserts into the ulna on the upper part of the bone's posterior surface. Along with the triceps brachii, the anconeus helps straighten the lower arm at the elbow (extension).

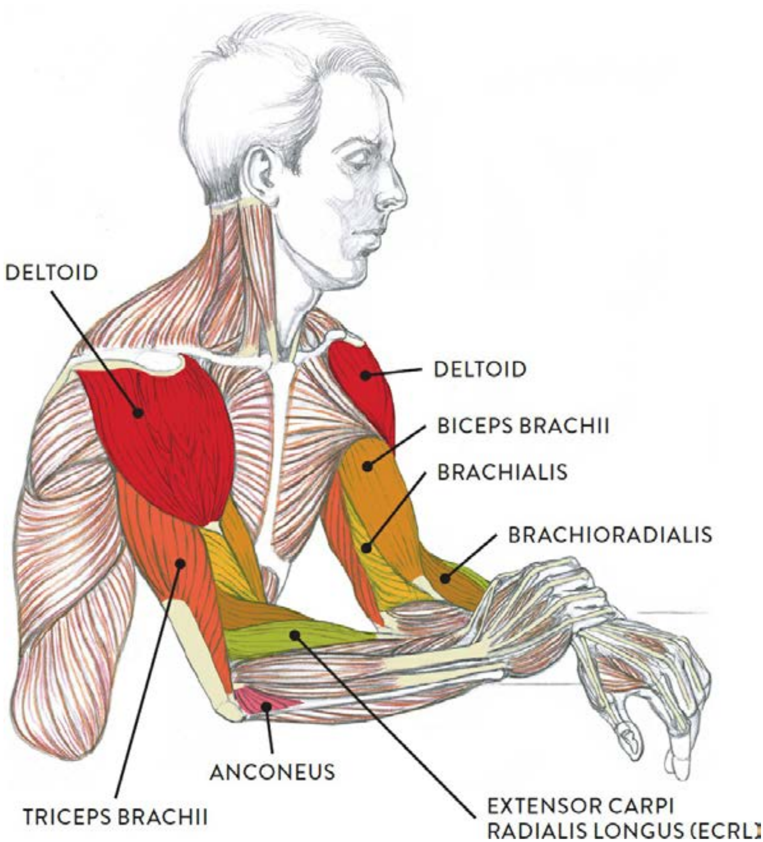
The muscles of the upper arm can be clearly seen in the well-defined arms of the model in the life study *Male Figure Resting with One Hand over the Other Arm*. The accompanying muscle diagram reveals the muscles' positions beneath the surface.

MALE FIGURE RESTING WITH ONE HAND OVER THE OTHER ARM



Graphite pencil, ballpoint pen, watercolor pencil, and white chalk on toned paper.

MUSCLE DIAGRAM



Muscle Groups of the Lower Arm

Of all the body's muscles, those of the lower arm may be the most challenging to learn, for several reasons:

1. Some of these muscles have very similar names (e.g., *flexor carpi ulnaris* and *extensor carpi ulnaris*), which often causes confusion.
2. The various lower arm muscles look very similar to each other on écorché charts, appearing as slender muscles with extremely long tendons. (Écorché charts are diagrams showing the figure without skin or subcutaneous tissue, so that the muscles are clearly visible.)
3. On the surface, the muscles of the lower arm generally register as a single form rather than as distinct, obvious shapes like the biceps brachii or deltoid, making them difficult to locate.
4. When the lower arm rotates at the elbow joint, these muscles engage in a spiraling action, further contributing to the complexity of this region.

It is possible, however, to locate the muscles' general whereabouts as the lower arm moves to different positions. One key is to keep an eye on the bony landmarks of the arms, such as the medial and lateral condyles of the humerus, which are important attachment sites for various lower arm muscles. Muscles also attach along the ulna, which can be located by tracing a line from the elbow (olecranon) down the little-finger side of the hand to the ulna head, the small protrusion of bone at the outer wrist. (The radius bone, located on the thumb side of the hand, is harder to detect on the surface.)

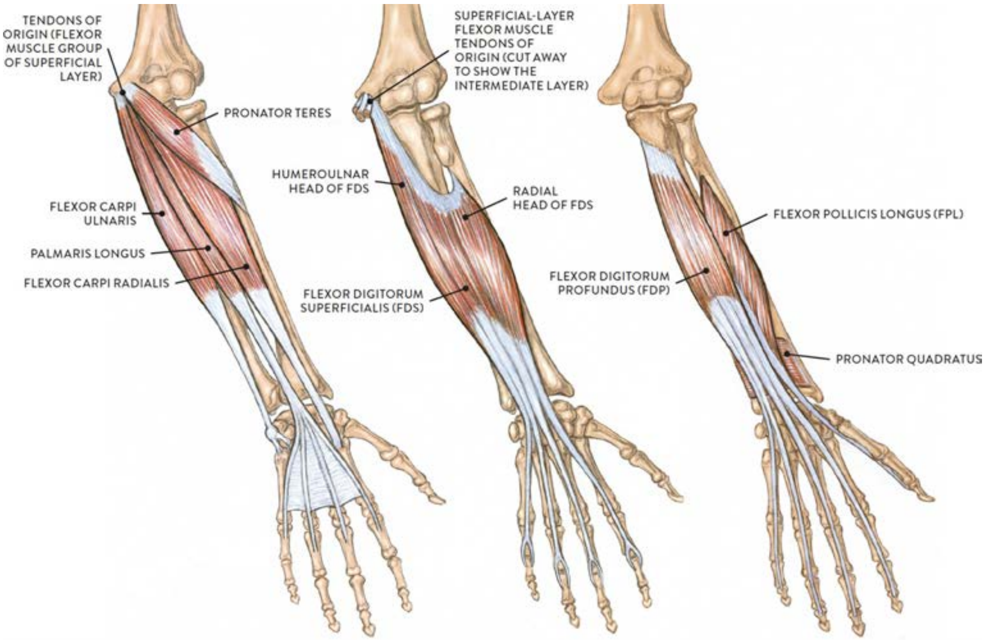
The lower arm has three muscle layers on the anterior region: the superficial layer, the intermediate layer, and the deep layer. On the posterior region, there are just two: the superficial layer and the deep layer. Although the discussion that follows focuses mostly on the superficial layer, the intermediate and deep layers are introduced to give you an idea of how the forms are built atop one another.

Like the muscles of the upper arm, some of the muscles of the lower arm are divided into *flexor* and *extensor* muscle groups located in the three layers (superficial, intermediate, and deep). Knowing the meanings of these terms can help you locate certain muscles and give you a better sense of their roles in movement. A muscle with the term *flexor* in its name is probably located on the anterior region of the lower arm, and its primary action is to flex, or bend, the hand and fingers (depending on the layer). A muscle with the term *extensor* in its name is probably located on the posterior region of the lower arm, and its primary action is to extend, or straighten, the hand, fingers, and

thumb (again depending on the layer). In addition to the flexor and extensor muscle groups, the muscles of the lower arm include the *radial muscle group,* which is located in the lateral (outer) region of the lower arm. As its name implies, this group is positioned along the radius bone of the lower arm. Note that some lower arm muscles (e.g., the extensor carpi radialis longus) may be classified as belonging to more than one group.

The Flexor Muscle Group of the Lower Arm

Let's look first at the flexor muscle group of the anterior region of the lower arm. There are three muscle layers in this region: superficial, intermediate, and deep. The following drawing shows the three layers from the anterior view. In all three views, the lower left arm is positioned with the palm facing toward the viewer.



Lower left arm, anterior view, palm facing front

LEFT: Superficial layer

CENTER: Intermediate layer

RIGHT: Deep layer

Anterior Region, Superficial Muscle Layer (of the Flexor Muscle Group)

Four main muscles of the anterior region of the lower arm begin on the medial epicondyle of the humerus. These are the pronator teres, flexor carpi radialis, palmaris longus, and flexor carpi ulnaris. With the exception of the pronator teres, these muscles insert into the general anterior region of the hand and are responsible for moving the hand at the wrist joint.

The *pronator teres* (pron., pro-NAY-tor TEH-reez or PRO-nay-tor TEH-reez) has two heads: a humeral head, which begins on the medial epicondyle of the humerus, and an ulnar head, which begins on the corocoid process of the ulna bone. Both heads merge and insert about midway along the shaft of the radius bone. The pronator teres muscle assists in rotating the lower arm (pronation) and helps bend the lower arm at the elbow

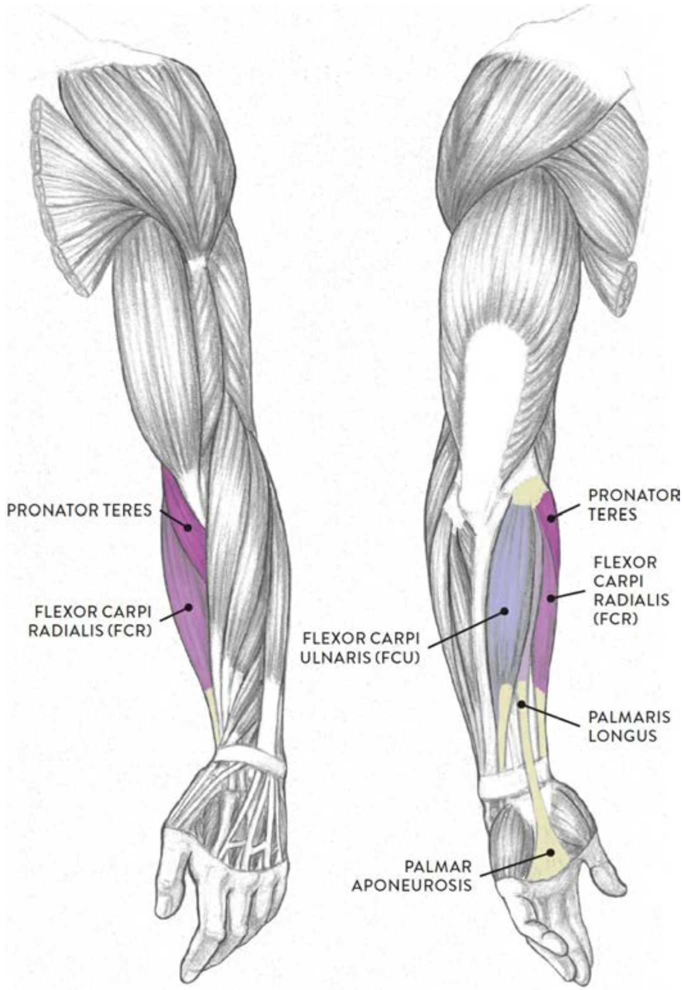
joint (flexion).

The *flexor carpi radialis* (pron., FLEK-sor KAR-pea ray-dee-AL-iss or FLEK-sor KARP-eye RAY-dee-ah-liss), or FCR, is a slender muscle positioned on the thumb side of the lower arm. The muscle begins on the medial epicondyle of the humerus and the antebrachial fascia, which is the deep fascia of the lower arm. It inserts by way of a long slender tendon into the bases of the second and third metacarpal bones of the hand. The flexor carpi radialis bends the hand toward the inner lower arm (flexion of the hand at the wrist joint) and assists in bending the hand sideways at the wrist (radial abduction of the hand at the wrist joint).

The *palmaris longus* (pron., pahl-MAR-iss LON-gus) is a thin muscle positioned in the middle of the lower arm. The muscle begins on the medial epicondyle of the humerus. Halfway down the shaft of the lower arm it becomes a slender tendon that, when it passes the wrist, flares out into a fan shape and inserts into the palmar aponeurosis, a fibrous sheathing of the palm. The palmaris longus helps bend the hand toward the inner lower arm (flexion of hand at wrist joint). It also helps tense or tighten the palmar aponeroneus and skin during certain hand movements, such as gripping an object.

The *flexor carpi ulnaris* (pron., FLEK-sor KAR-pea ull-NARE-iss or FLEK-sor KARP-eye ull-NARE-iss), or FCU, is positioned on the outer edge of the ulna bone for nearly its entire length. It has two heads: a humeral head and an ulnar head. The humeral head begins on the medial epicondyle of the humerus, and the ulnar portion begins near the olecranon (elbow) and the upper two-thirds of the posterior border of the ulna. The muscle inserts into the pisaform and hamate carpal bones, the fifth metacarpal bone, and the flexor retinaculum, which is a bracelet-like fibrous sheathing of the wrist region. The flexor carpi ulnaris bends the hand toward the inner lower arm (flexion of the hand at the wrist joint) and assists in bending the hand sideways (ulnar adduction at the wrist joint).

FLEXOR MUSCLE GROUP OF THE LOWER ARM, SUPERFICIAL LAYER



Left upper and lower arm

LEFT: Anterior three-quarter view

RIGHT: Posterior three-quarter view

Anterior Region, Intermediate Muscle Layer (of the Flexor Muscle Group)

The *flexor digitorum superficialis* (pron., FLEK-sor dij-ih-TOR-um SOO-pur-FISH-ee-

AL-iss), or FDS, is positioned beneath the superficial-layer flexor muscles discussed just above. Some experts consider it part of the superficial muscle layer, hence its name. Others, however, classify it as belonging to an intermediate muscle layer between the superficial and deep layers of the lower arm.

The flexor digitorum superficialis has two heads: the humeroulnar head and the radial head. The humeroulnar head begins on the medial epicondyle of the humerus and the coronoid process of the ulna. The radial head begins on the radius. The muscle splits into four tendons, each of which inserts into the middle phalange of each finger. The flexor digitorum superficialis bends the fingers at the metacarpophalangeal (MCP) joints and proximal interphalangeal (PIP) joints (flexion of fingers). It also helps bend the hand (flexion of the hand at the wrist joint).

Anterior Region, Deep Muscle Layer (of the Flexor Muscle Group)

The three flexor muscles of the deep muscle layer are situated beneath the flexor digitorum superficialis muscle. These muscles—the flexor digitorum profundus, flexor pollicis longus, and pronator quadratus—move the fingers and thumb and help move the hand and lower arm (radius) at the wrist joint.

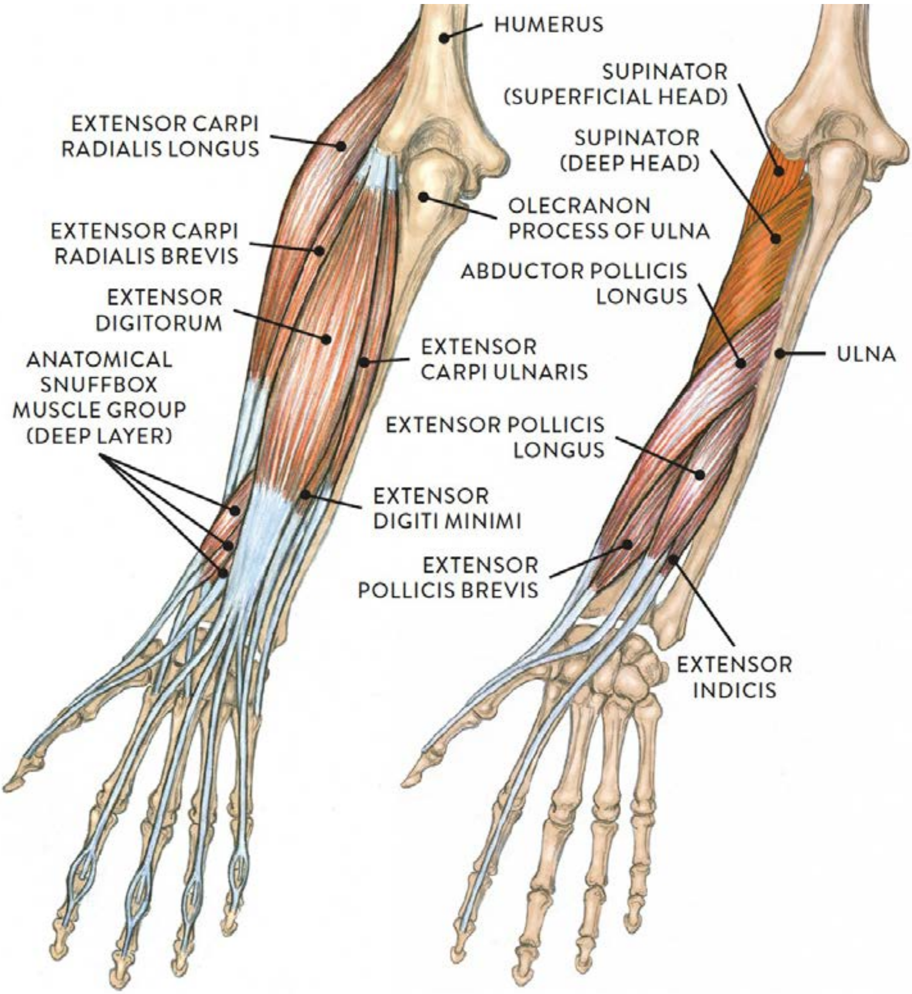
The *flexor digitorum profundus* (pron., FLEK-sor dij-ih-TOR-um pro-FUN-dus), or FDP, influences the surface form by creating a muscular mass of the inner forearm, along with the flexor carpi ulnaris. The muscle begins on the ulna and interosseous membrane (the connective tissue between the two bones of the lower arm) and then splits into four separate tendons, each inserting into a finger. The flexor digitorum profundus bends the fingers (flexion of fingers) at the distal interphalangeal (DIP) joints and helps bend the hand (flexion of hand at the wrist joint).

The *flexor pollicis longus* (pron., FLEK-sor pawl-lih-kiss LON-gus or FLEK-sor poe-LEE-siss LON-gus), or FPL, while being a deep-layer muscle, also contributes to the surface form on the anterior region of the lower arm, on the radial side. The muscle attaches on the radius and interosseous membrane and inserts into the base of the distal phalanx of the thumb. The flexor pollicis longus bends the thumb (flexion of the thumb) at the MCP and IP joints.

The *pronator quadratus* (pro-NAY-tor kwa-DRAH-tus) is a quadrangular muscle located on the lower portions of the radius and ulna bones. The muscle is so deep that some texts categorize it as belonging to a fourth muscle layer of the lower arm. The pronator quadratus begins on the ulna (medial and anterior surfaces) and inserts into the radius (anterior lateral surface). As its name implies, it helps rotate the lower arm and hand in the action of pronation.

The Extensor Muscle Group of the Lower Arm

Now we move on to the extensor muscle group of the posterior side of the lower arm, which has two muscle layers: superficial and deep. The muscles of these layers are shown in the following drawing. In both views, the lower left arm is positioned with the back (dorsal side) of the hand facing toward the viewer.

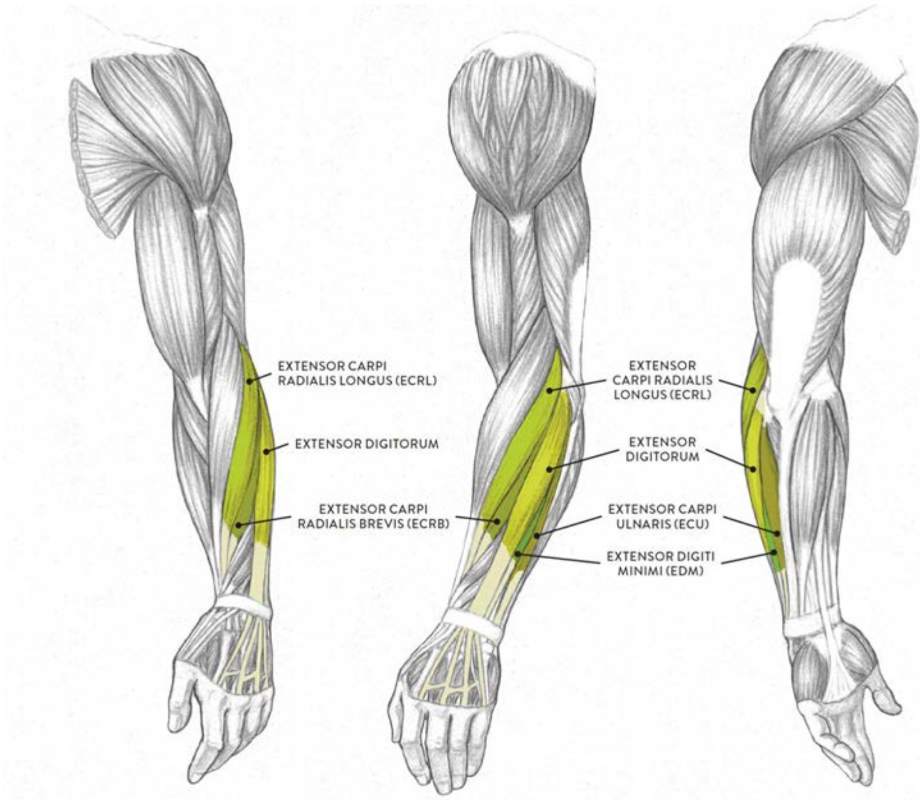


Lower left arm, posterior view, back of hand facing front

Posterior Region, Superficial Muscle Layer (of the Extensor Muscle Group)

The extensor muscle group of the superficial layer of the lower arm includes the extensor carpi radialis longus (ECRL), the extensor carpi radialis brevis (ECRB), the extensor digitorum, the extensor carpi ulnaris (ECU), and a small muscle called the extensor digiti

minimi (EDM), all shown in the next drawing. All these muscles except the ECRL begin on the lateral epicondyle of the humerus, sharing a common tendon at this location. The ECRL begins above the lateral epicondyle of the humerus and does not share the common tendon of origin. The individual muscles insert by way of elongated tendons into various bones of the hand on the dorsal side. All four extensor muscles help move the hand at the wrist joint, and the extensor digitorum moves the fingers at the metacarpophalangeal (MCP) joints, proximal interphalangeal (PIP) joints, and the distal interphalangeal (DIP) joints.



Left upper and lower arm

LEFT: Anterior three-quarter view

CENTER: Lateral view

RIGHT: Posterior three-quarter view

The *extensor carpi radialis longus* (pron., ek-STEN-sor KAR-pea ray-dee-AA-lis LON-gus or ek-STEN-sor KARP-eye RAY-dee-ah-liss LON-gus), or ECRL, is an elongated fusiform muscle that travels parallel to the brachioradialis. This muscle, which is also part of the radial muscle group of the lower arm, begins on the lower part of the humerus, above the lateral epicondyle and slightly below where the brachioradialis begins. It eventually inserts by way of a long, slender tendon on the second metacarpal bone of the hand. The ECRL helps straighten the hand at the wrist joint (extension) and also moves the hand in a side direction on the radial side of the

lower arm (radial abduction).

The *extensor carpi radialis brevis* (pron., ek-STEN-sor KAR-pea ray-dee-AA-liss BREH-viss or ek-STEN-sor KARP-eye RAY-dee-ah-liss BREV-iss), or ECRB, is a slender muscle positioned between the ECRL and the extensor digitorum muscle on the posterior side of the lower arm. It begins on the lateral epicondyle of the humerus and inserts into the third metacarpal bone of the hand. The ECRB assists in straightening the hand at the wrist joint (extension) and in moving the hand in a sideways direction at the wrist (radial abduction).

The *extensor digitorum* (pron., ek-STEN-sor dij-ih-TOR-um) is positioned on the posterior side of the lower arm between the ECRB and the extensor carpi ulnaris. The muscle begins on the lateral epicondyle of the humerus. About halfway down its length, the muscle merges into a flat broad tendon, which then splits into four slender tendons at the wrist, which insert into the fingers via the four tendons. The extensor digitorum helps straightens the hand at the wrist joint and straightens the four fingers at the MCP joints (extension), PIP joints, and DIP joints.

The *extensor digiti minimi* (pron., ek-STEN-sor DIH-jih-tee MIN-ih-mee or ek-STEN-sor DIJ-ih-tie MIN-ih-my), or EDM, is an extremely slender fusiform muscle with an elongated tendon. It is linked to the extensor digitorum muscle. It begins on the lateral epicondyle of the humerus and inserts (along with the tendon of the extensor digitorum) into the fifth finger (little finger). The EDM straightens the fifth finger at the PIP and DIP joints.

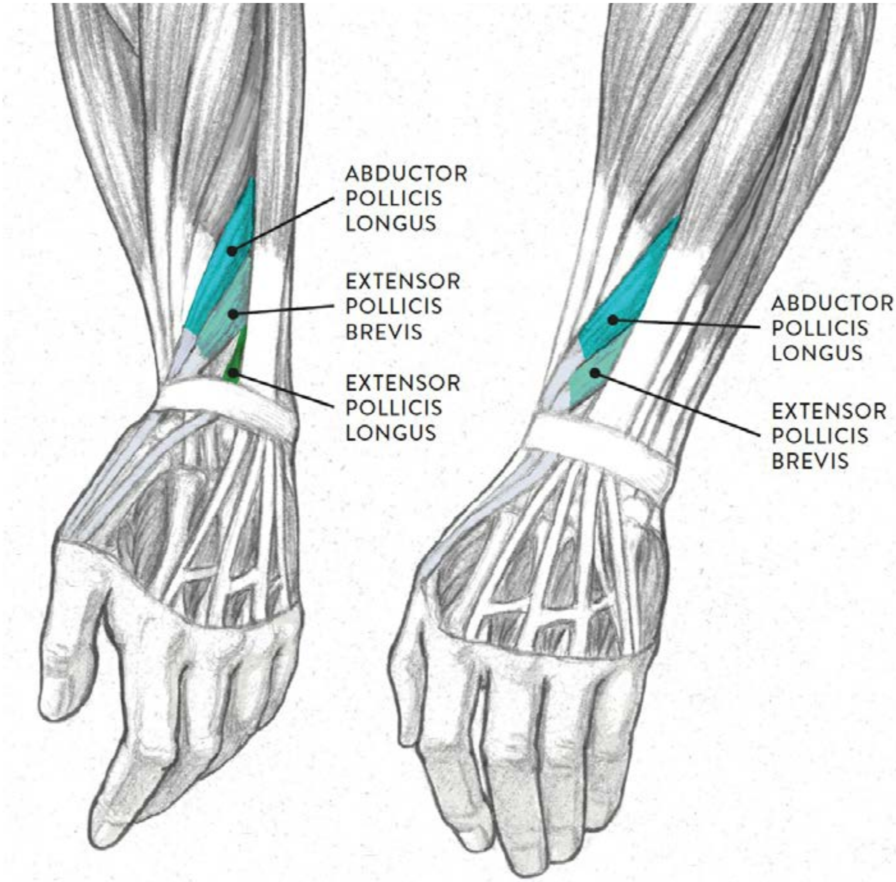
The *extensor carpi ulnaris* (pron., ek-STEN-sor KAR-pea ull-NARE-riss or ek-STEN-sor KARP-eye ull-NARE-riss), or ECU, is a two-headed fusiform muscle with a long tendon that is positioned on the medial/posterior region of the lower arm. The humeral head begins on the lateral epicondyle, and the ulnar head begins on the posterior border of the ulna and inserts into the fifth metacarpal bone of the hand. The ECU straightens the hand at the wrist (extension) and moves the hand in a sideways direction at the wrist (ulnar adduction).

Posterior Region, Deep Muscle Layer (of the Extensor Muscle Group)

Located in the deep muscle layer of the posterior region of the lower arm is a group of muscles colloquially called the *anatomical snuffbox muscles* because their long tendons create an elongated triangular depression, called the anatomical snuffbox, in the skin near the wrist. In times past, it was fashionable for people to place a pinch of ground tobacco (snuff) in this depression and inhale it through their nostrils. Also known as the *extrinsic thumb muscle group,* the group has three muscles: the abductor pollicis longus, the extensor pollicis longus, and the extensor pollicis brevis. They begin on the ulna and radius bones, as well as on the interosseous membrane, and insert their tendons into the

thumb bones. These tendons can be quite prominent on the surface when the thumb is extended in a “thumbs up” movement. These three muscles emerge in a diagonal direction from a location between the extensor digitorum and the extensor carpi radialis brevis (ECRB) muscles, unlike the muscles of the other layers, which descend in a vertical direction.

ANATOMICAL SNUFFBOX MUSCLES (EXTRINSIC THUMB MUSCLE GROUP)



Dorsal region of left hand, two views

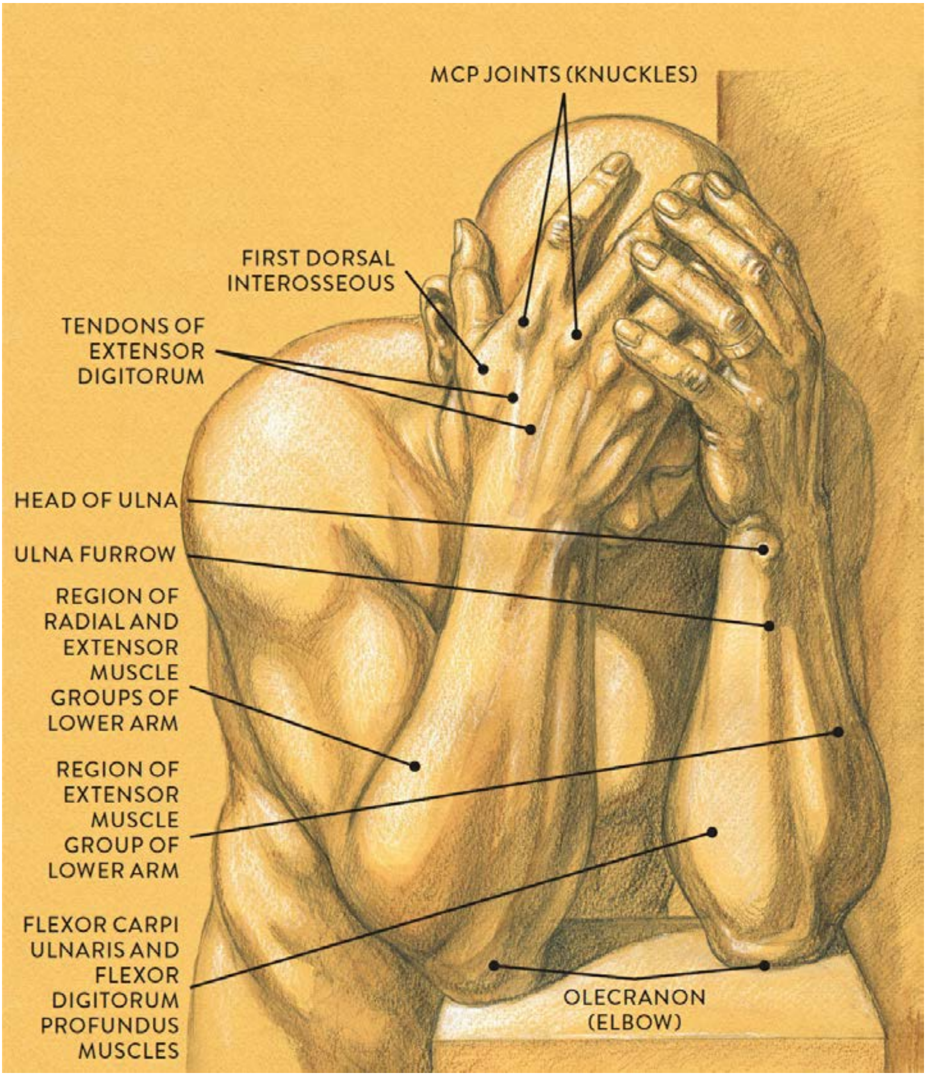
Anatomical Snuffbox Muscles—Pronunciation Guide	
MUSCLE	**PRONUNCIATION**
abductor pollicis longus	ab-DUCK-tor PAWL-lih-kiss LON-gus or ab-DUCK-tor poe-LEE-siss LON-gus
extensor pollicis brevis	ek-STEN-sor PAWL-lih-kiss BREV-iss or ek-STEN-sor poe-LEE-siss BREH-viss
extensor pollicis longus	ek-STEN-sor PAWL-lih-kiss LON-gus or ek-STEN-sor poe-LEE-siss LON-gus

Also located in the deep layer of the lower arm are two other muscles: the supinator and the extensor indicis. The *supinator* (pron., SOO-pih-NAY-tor) muscle is covered by the superficial muscles of the extensor group and is not seen on the surface form. This two-headed muscle begins on the humerus (superficial head) and ulna (deep head) and inserts into the radius. As its name implies, the supinator rotates the lower arm in the action of supination.

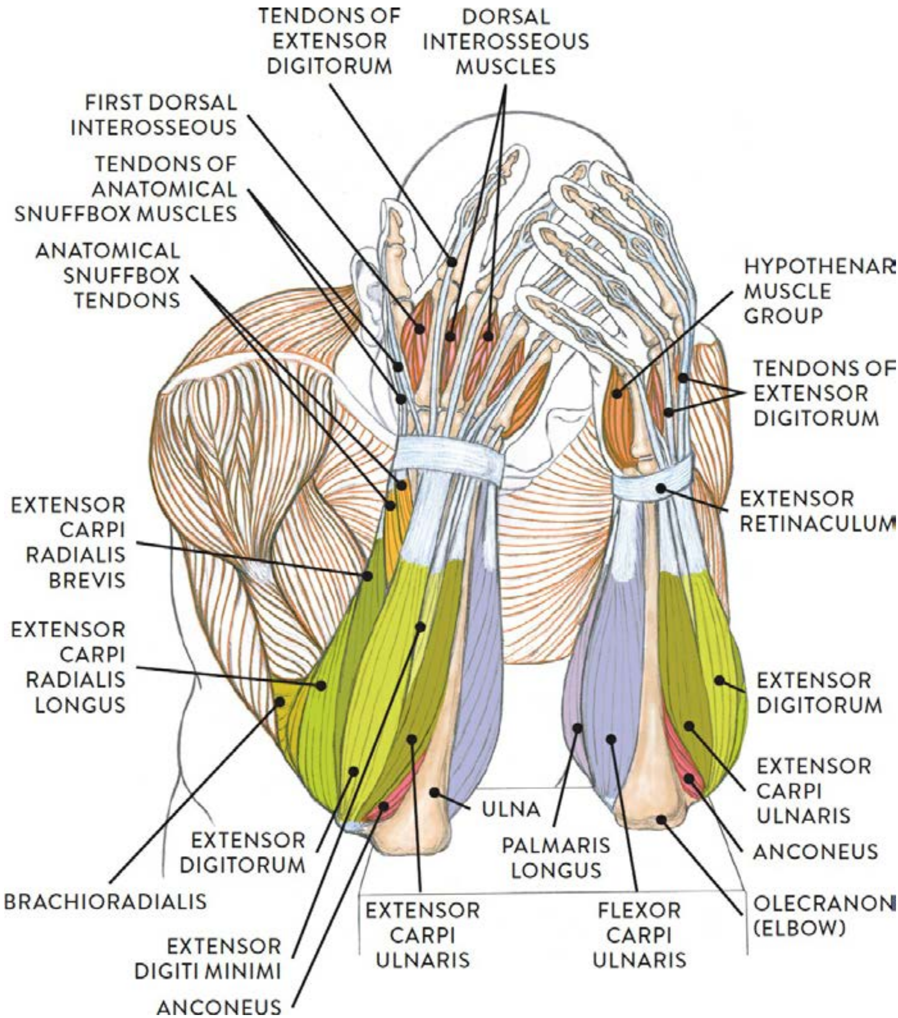
The *extensor indicis* (pron., ek-STEN-sor IN-dih-siss) is a narrow fusiform muscle that runs parallel to one of the anatomical snuffbox muscles (extensor pollicis longus). It begins on the posterior surface of the ulna and the interosseous membrane and inserts into the index finger. The extensor indicis straightens the index finger (extension) at the MCP, DIP, and PIP joints and also helps straighten the hand (extension) at the wrist joint.

The life study *Male Figure Clasping His Head in His Hands,* shows a man with muscular lower arms and large hands. The accompanying muscle diagram reveals the positions of the lower arm muscles and their tendons in this pose.

MALE FIGURE CLASPING HIS HEAD IN HIS HANDS



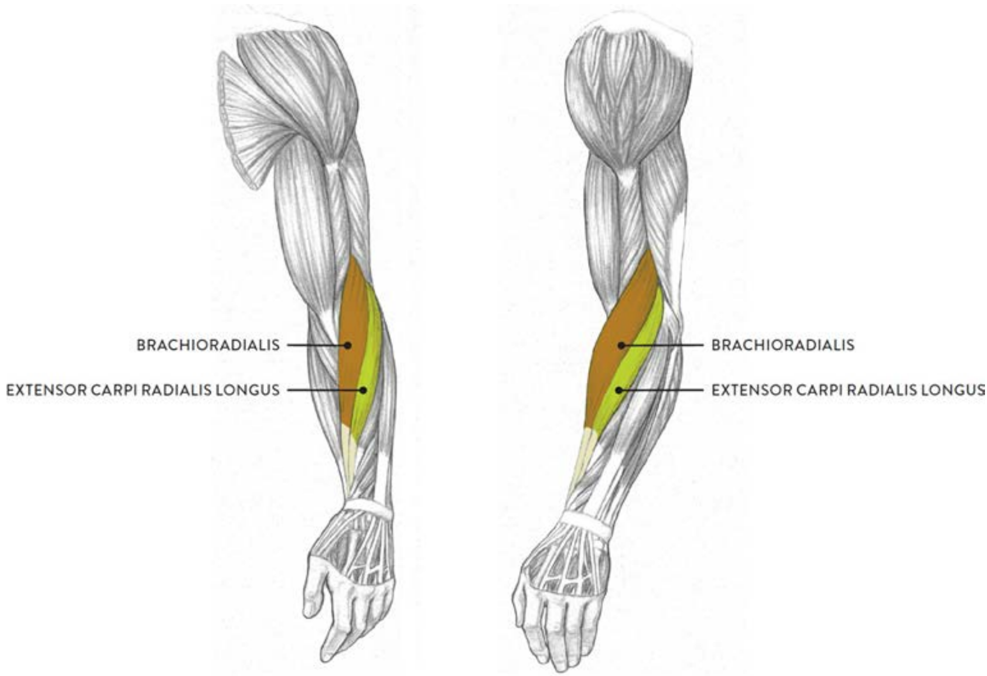
Graphite pencil, watercolor wash, and white chalk on toned paper.



The Radial Muscle Group

Located in the superficial muscle layer of the lateral region of the lower arm, the radial muscle group provides an interesting transition between the upper arm and the lower arm. The radial group consists of two muscles: the brachioradialis and the extensor carpi radialis longus (ECRL). Some anatomists add a third muscle, called the extensor carpi radialis brevis (ECRB), to the group, but since this muscle is rather slender and hard to

detect on the surface form except in muscularly defined arms, we focus here on the other two muscles, shown in the lower drawing opposite. The radial group moves the lower arm (radius and ulna) at the elbow joint and the hand at the wrist joint.



Left upper and lower arm

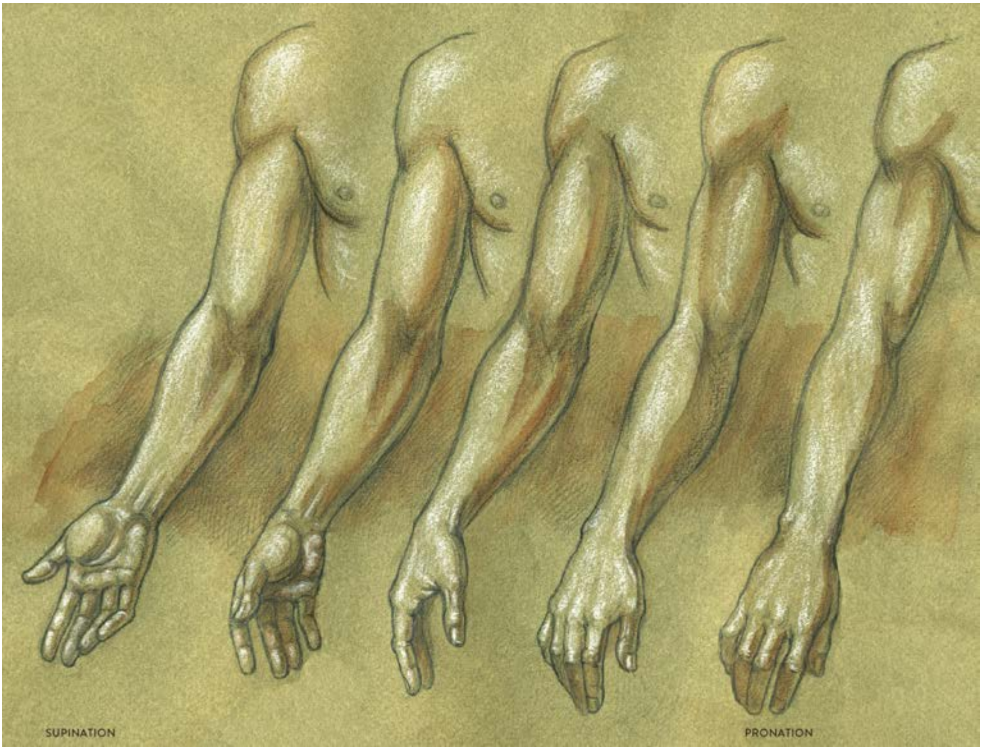
LEFT: Anterior three-quarter view

RIGHT: Lateral view

The radial group serves as an important surface landmark for artists. Its rich, elongated shape begins on the outer part of the humerus and spirals downward along the radius bone toward the thumb side of the wrist. The shapes of these two muscles register as a single form on the average arm but as individual muscular ridges on the athletically defined arm.

The next drawing shows the right arm in the anatomical position, slowly rotating from the elbow joint to move the hand from a position in which the palm faces forward (supination) to a position in which the back of the hand faces forward (pronation). While the extensor carpi radialis longus does not assist in this movement, its presence in the radial group is important in that it clearly shows the spiraling action of the lower arm, along with the brachioradialis. The brachioradialis (formerly known as the supinator longus) participates in both pronation and supination. Other muscles participating in the action of pronation are the pronator teres and the pronator quadratus; the biceps brachii

and the supinator muscles participate in the action of supination.

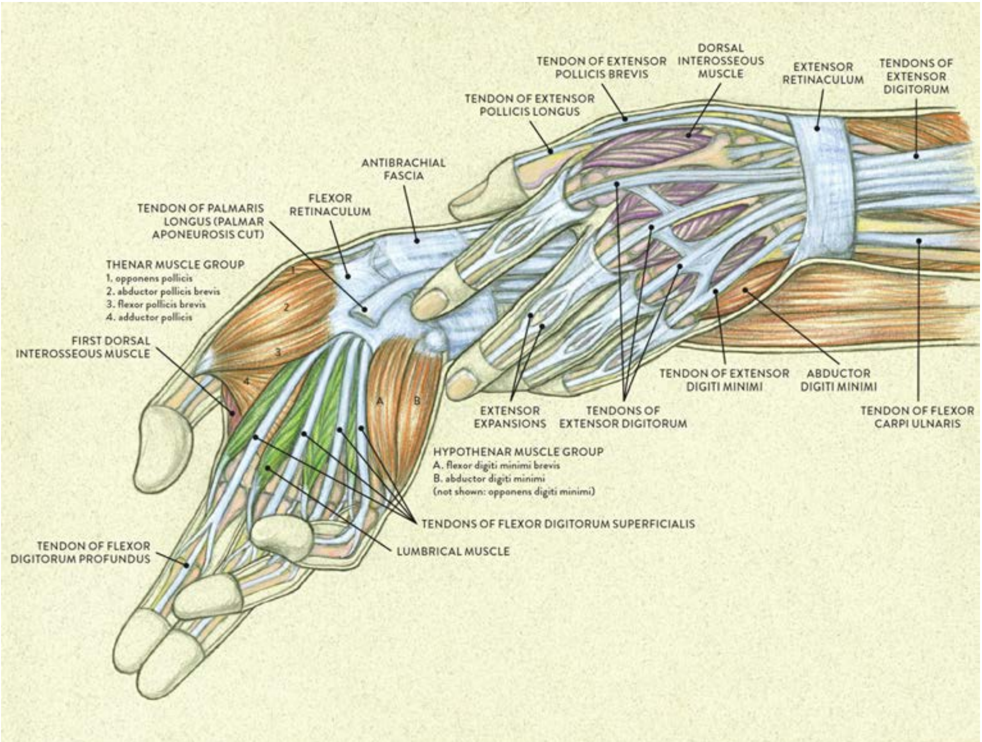


Right upper and lower arm, anterior view

The *brachioradialis* (pron., bray-kee-oh-ray-dee-AL-iss) is the most prominent shape of the radial group, appearing as a thick spiraling form near the elbow region. The brachioradialis begins on the outer side of the humerus and inserts by way of a long slender tendon into the lower portion of the radius. It is positioned between the extensor carpi radialis longus (of the radial muscle group) and the pronator teres and flexor carpi radialis (of the flexor muscle group). The brachioradialis helps bend the lower arm (flexion), and as stated above, it also assists in the supination and pronation of the lower arm. (The extensor carpi radialis longus has already been covered; see this page.)

Muscles of the Hand

The two sides of the hand have differing and very distinctive characteristics. The palmar (palm) region contains rich muscle forms and fibrous padding, while on the dorsal (back) side the skin pulls tightly over bones and tendons, creating a streamlined appearance.



LEFT: Palmar side of right hand, anterior view

RIGHT: Dorsal side of left hand, posterior view

The dorsal region of the hand contains only one group of muscles, the *dorsal interosseous muscle group.* Except for the first dorsal interosseous muscle, these muscles are hidden from view on the surface. The palmar region of the hand has two muscle groups: the *thenar muscle group* and the *hypothenar muscle group.*

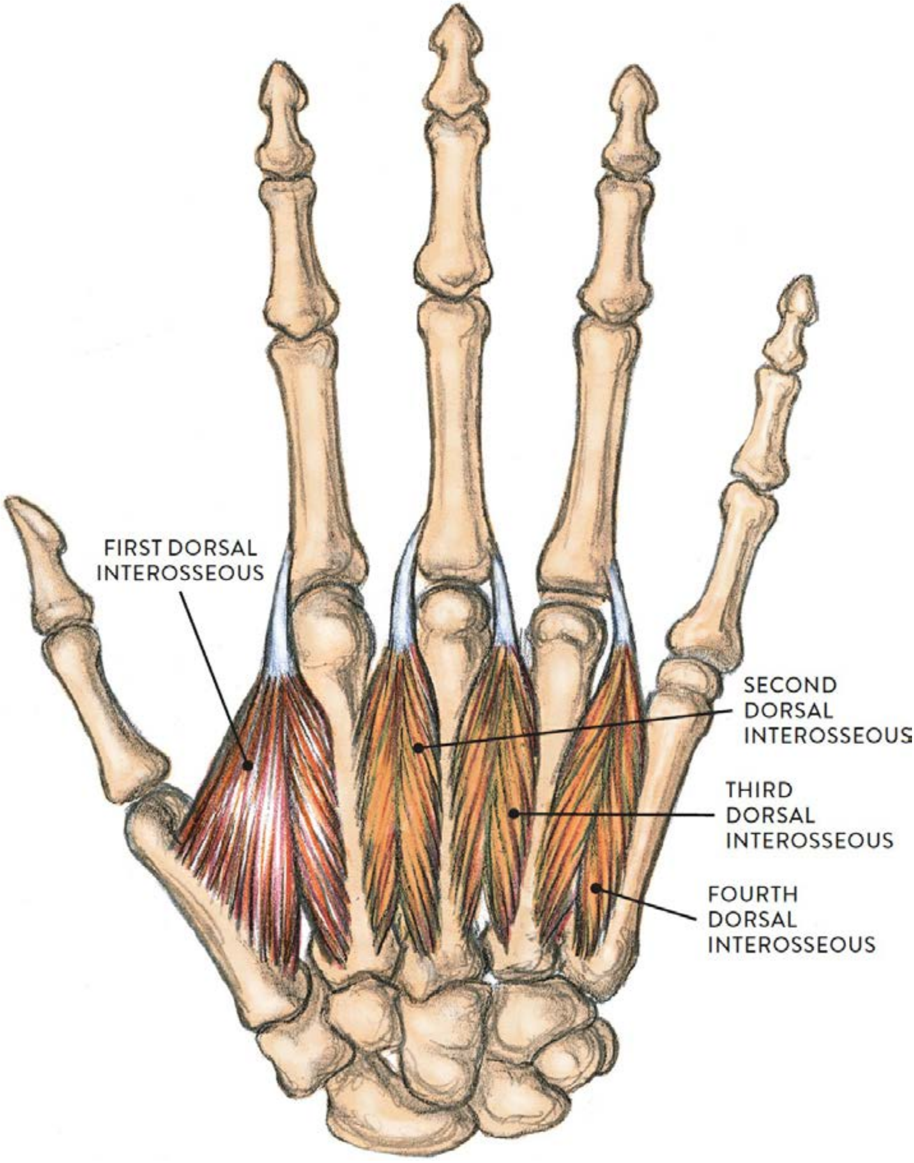
There are no muscles below the metacarpophalangeal joints (MCP joints, or knuckles) of the hand; instead, the fingers (including the thumb) contain sheaths for the many tendons of the muscles that move them, which originate on the lower arm. The palm and the palmar side of the fingers, especially at their tips, also contain fibrous padding (see this page).

In the following drawing *Study of Theresa's Hands,* you can see the tendons of the extensor digitorum muscle pulling toward the knuckles (MCP joints). On the outer sides of the hands the hypothenar muscle group is partly visible.

Graphite pencil and white chalk on toned paper.

The Interosseous Muscle Group

The term *interosseous* (pron., in-tur-OSS-ee-us) means "between bones," and that is exactly where the muscles of the interosseous group attach—between the metacarpal bones of the hand. There are two different groups of interosseous muscles, each containing four muscles. The *dorsal interosseous muscle group* shown in the following drawing, is located on the dorsal region of the hand; when these muscles contract they mainly spread the fingers apart (abduction). The *palmar interosseous muscle group* (not shown) is located on the palm side of the hand; when these muscles contract they return the spread fingers to their normal position (adduction).

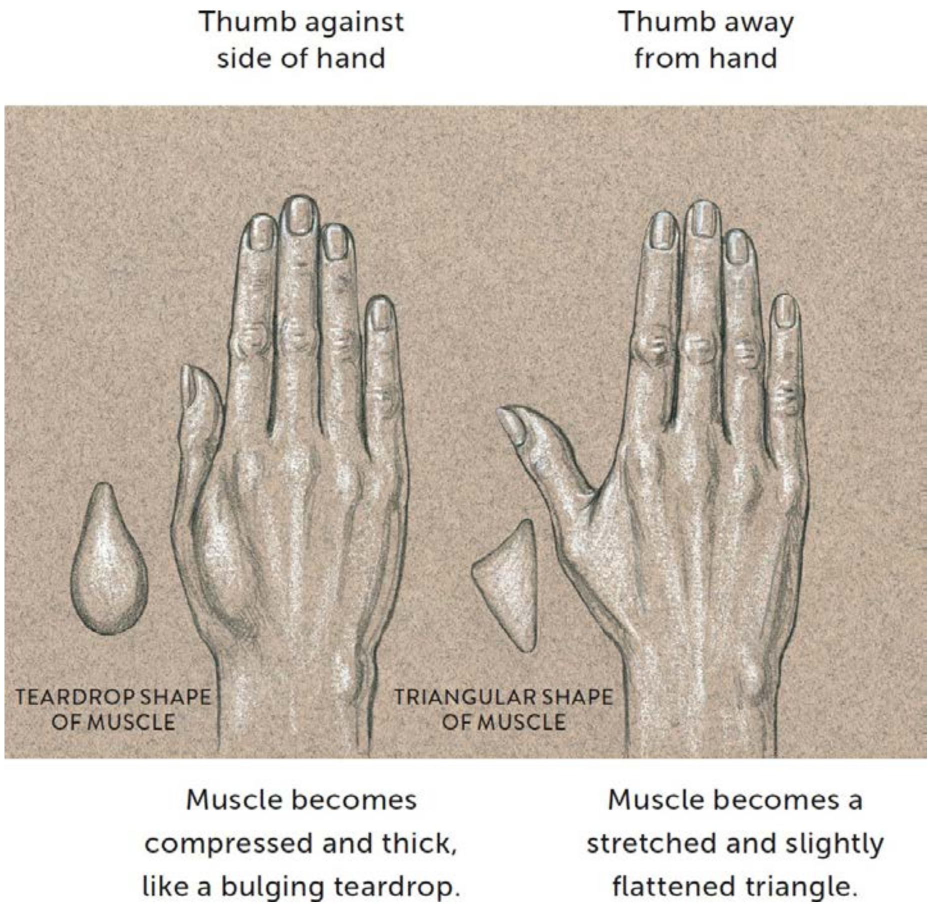


Dorsal side of right hand, posterior view

Only one interosseous muscle—the *first dorsal interosseous*—can be detected on the surface. The muscle fills the space between the metacarpal bone of the thumb and the

metacarpal of the index finger. This triangular muscular space is sometimes referred to as the *triangle of the thumb*. The muscle changes shape depending on the placement of the thumb, as can be seen in the next drawing. It is easily seen when the thumb is pulled away from the hand in a sideways or downward direction. When the thumb is pressed against the side of the hand, the triangular shape becomes a thicker muscular mound—a teardrop shape on the dorsal side of the hand. Depending on how a person uses his or her hands, this shape may be large and quite thick or softer and subtler.

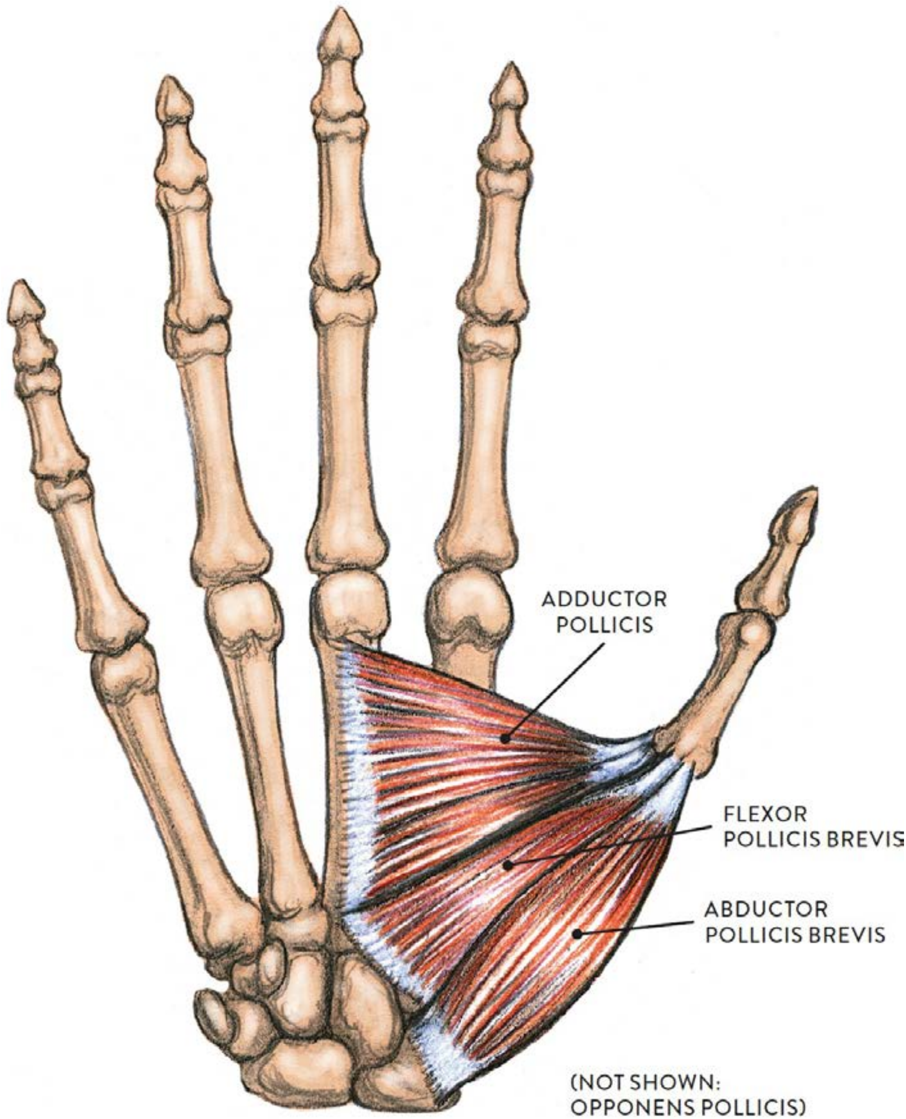
FIRST DORSAL INTEROSSEOUS MUSCLE—CHANGES IN SHAPE



The Thenar Muscle Group

The thenar group consists of four muscles that form the rich muscular mound found on the palm side of the hand below the thumb. It is commonly referred to as the *thumb prominence* or *thumb eminence* because of its large, distinctive shape on the palm. The muscles of the thenar group are the *adductor pollicis* (adductor of the thumb), *abductor pollicis brevis* (short abductor of the thumb), *flexor pollicis brevis* (short flexor of the thumb), and the *opponens pollicis* (which enables the thumb to *oppose* the other fingers). All except the opponens pollicis are shown in the following drawing. The names of these muscles are actually easier to remember than you might think. The word *pollicis,* which appears in each, means "thumb," and each name tells you how the muscle makes the

thumb move: adduction, abduction, flexion, and opposition. The muscle group attaches on various carpal bones, metacarpal bones, and the bracelet-like fibrous sheathing of the wrist region called the flexor retinaculum.



Palmar side of right hand

When drawing the palm side of the hand, you will usually detect the thenar group easily because of its large round shape positioned below the thumb. Since the muscles are covered with fibrous padding they usually cannot be distinguished individually, so it

is best to approach the thenar group as a single form. The overall shape of the thumb and the thenar group is similar to that of a poultry drumstick, with the thumb representing the bony portion of the leg and the thenar muscles representing the thicker, meatier portion.

The shape and surface characteristics of the thenar group change depending on the placement of the thumb, as shown in the next drawing. When the thumb is positioned against the side of the palm, the thenar portion becomes compressed and thick, and the thenar line that travels around the outer perimeter of the thenar mass becomes a deep crease or fold within the skin. When the thumb is pulled away from the palm in a sideways direction, the thenar group becomes stretched and slightly flattened. The thenar line is still noticeable, but now as a subtle crease on the surface of the skin.

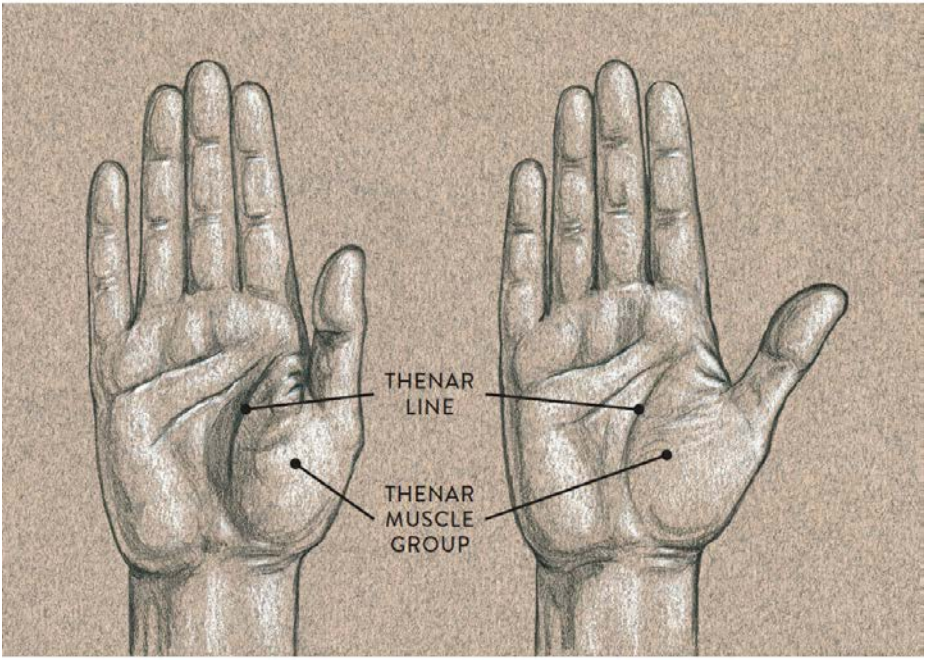
Thenar Group Muscles—Pronunciation Guide

MUSCLE	PRONUNCIATION
adductor pollicis	ah-DUCK-tor PAWL-lih-kiss or ah-DUCK-tor poe-LEE-siss
abductor pollicis brevis	ab-DUCK-tor PAWL-lih-kiss BREH-viss or ab-DUCK-tor poe-LEE-siss BREV-iss
flexor pollicis brevis	FLEK-sor PAWL-lih-kiss BREH-viss or FLEK-sor poe-LEE-siss BREV-iss
opponens pollicis	oh-POE-nenz PAWL-lih-kiss or oh-POE-nenz poe-LEE-siss

THENAR MUSCLE GROUP—CHANGES IN SHAPE

Thumb against side of palm

Thumb away from palm



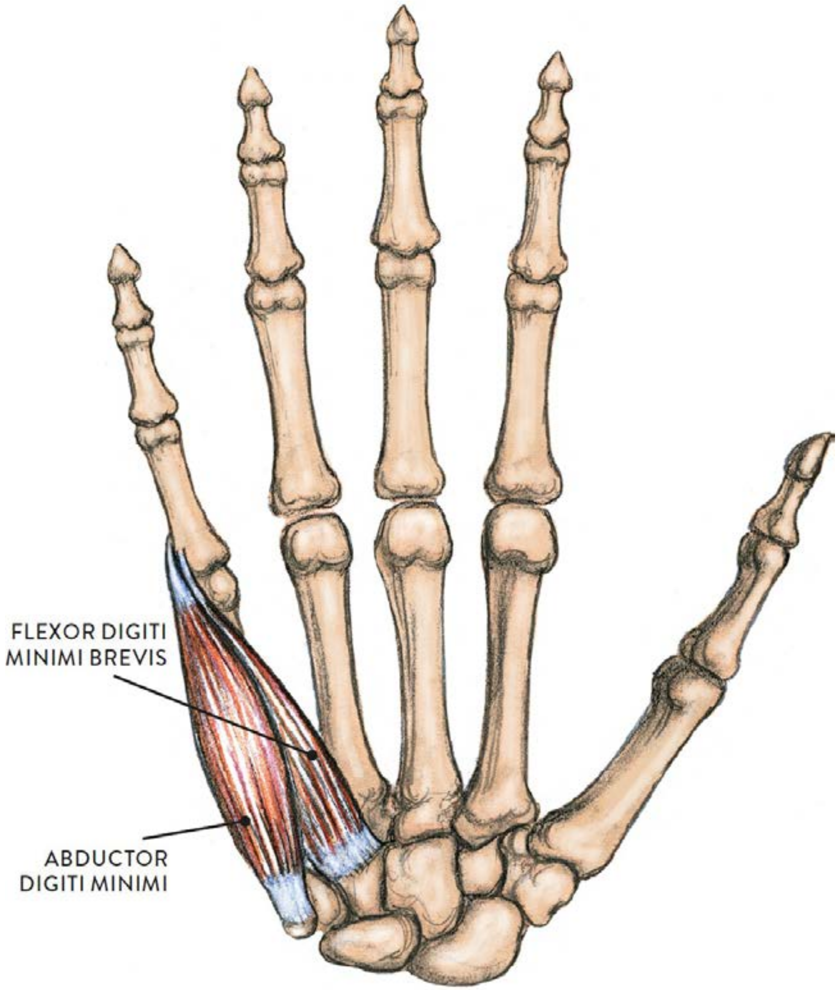
The thenar group is compressed and thick. The thenar line becomes a deep crease in the skin.

The thenar group becomes stretched and somewhat flattened. The thenar line is a subtle crease in the skin.

The Hypothenar Muscle Group

The hypothenar muscle group is an elongated teardrop form occupying the entire length of the side of the hand from the little finger to the heel of the hand. It consists of three muscles: the *abductor digiti minimi,* the *flexor digiti minimi brevis,* and the *opponens digiti minimi.* The abductor digiti minimi and flexor digiti minimi brevis are shown on this page (the opponens digiti minimi is not shown). As with the thenar group, it is not so hard to remember these muscles' names, since the term *digiti minimi* means "little finger" and each muscle's name tells you how it makes the little finger move: abduction, flexion, and opposition (in this case, enabling the little finger to oppose the thumb).

The opponens digiti minimi is positioned beneath the other two muscles and is hard to detect in most écorché views. Its shape, however, contributes to the fleshiness of the hypothenar group. The muscles are covered with fibrous padding, and so it is easier to see and depict them as a single form rather than individual muscles. The group is seen in palmar and side views of the hand on the little finger side.



(NOT SHOWN: OPPONENS DIGITI MINIMI)

Palmar side of right hand

Immediately below the little finger is a small fat pad that is part of an elongated fat pad that runs horizontally across the palm at the base of the fingers. At the lower border of this elongated pad is a flexor crease called the *distal palmar crease,* or *heart line.* When the little finger bends, this outer portion of the fat pad form becomes compressed and the flexor crease is etched more deeply in the skin, creating the illusion that the little

finger has an additional joint.

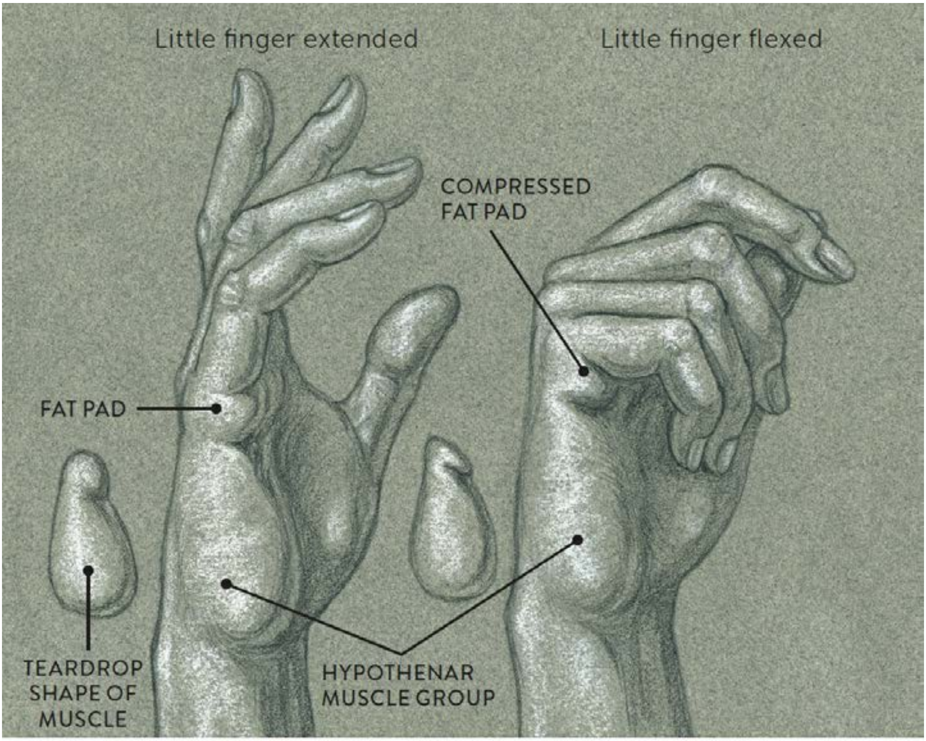
Hypothenar Group Muscles—Pronunciation Guide

MUSCLE	PRONUNCIATION
abductor digiti minimi	ab-DUCK-tor DIH-jih-tee MIN-ih-mee or ab-DUCK-tor DIJ-ih-tie MIN-ih-my
flexor digiti minimi brevis	FLEK-sor DIH-jih-tee MIN-ih-mee BREV-iss or FLEK-sor DIJ-ih-tie MIN-ih-my BREH-viss
opponens digiti minimi	oh-POE-nenz DIH-jih-tee MIN-ih-mee or oh-POE-nenz DIJ-ih-tie MIN-ih my

The following drawing consists of two life studies of the right hand, showing the overall teardrop appearance of the hypothenar group. On one hand the fingers are extended but relaxed; on the other they are flexed, enabling you to see how the fat pad at the base of the little finger becomes compressed when the little finger bends.

HYPOTHENAR MUSCLE GROUP—TEARDROP SHAPE

Right hand, lateral view

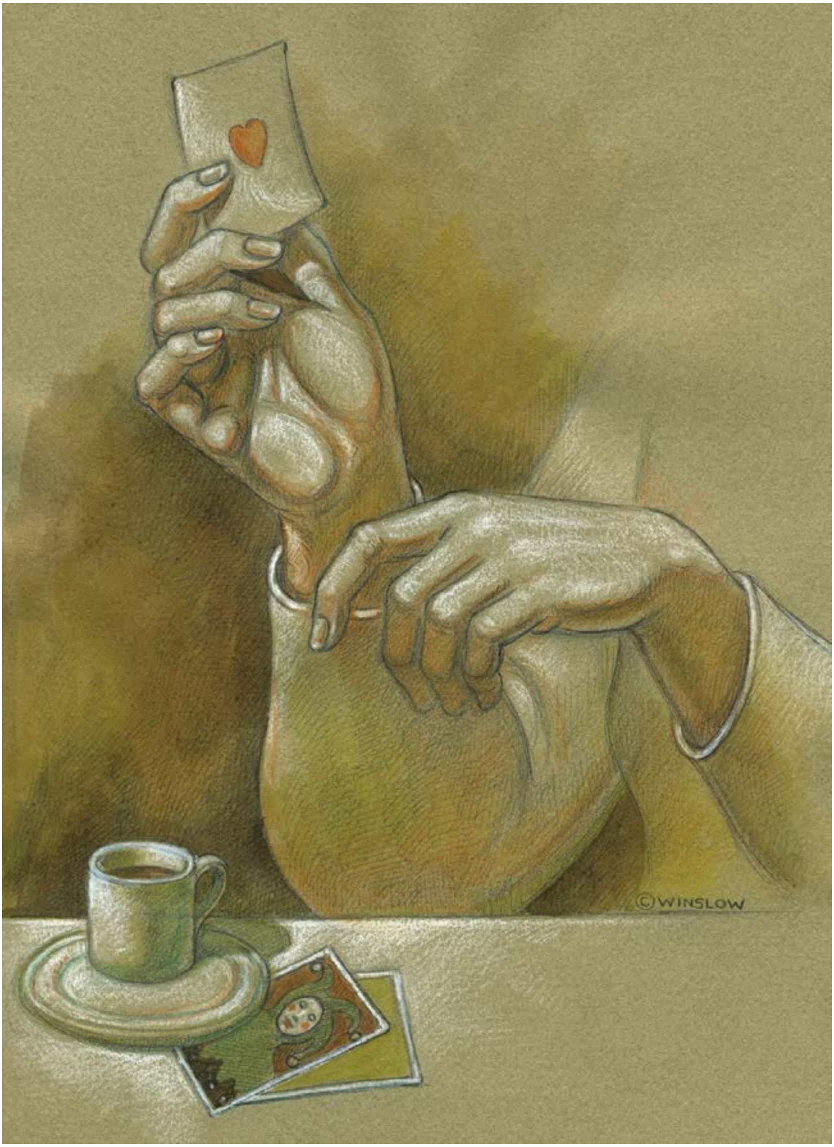


The small fat pad is visible immediately below the little finger.

The small fat pad compresses, making it appear that the little finger has an additional joint.

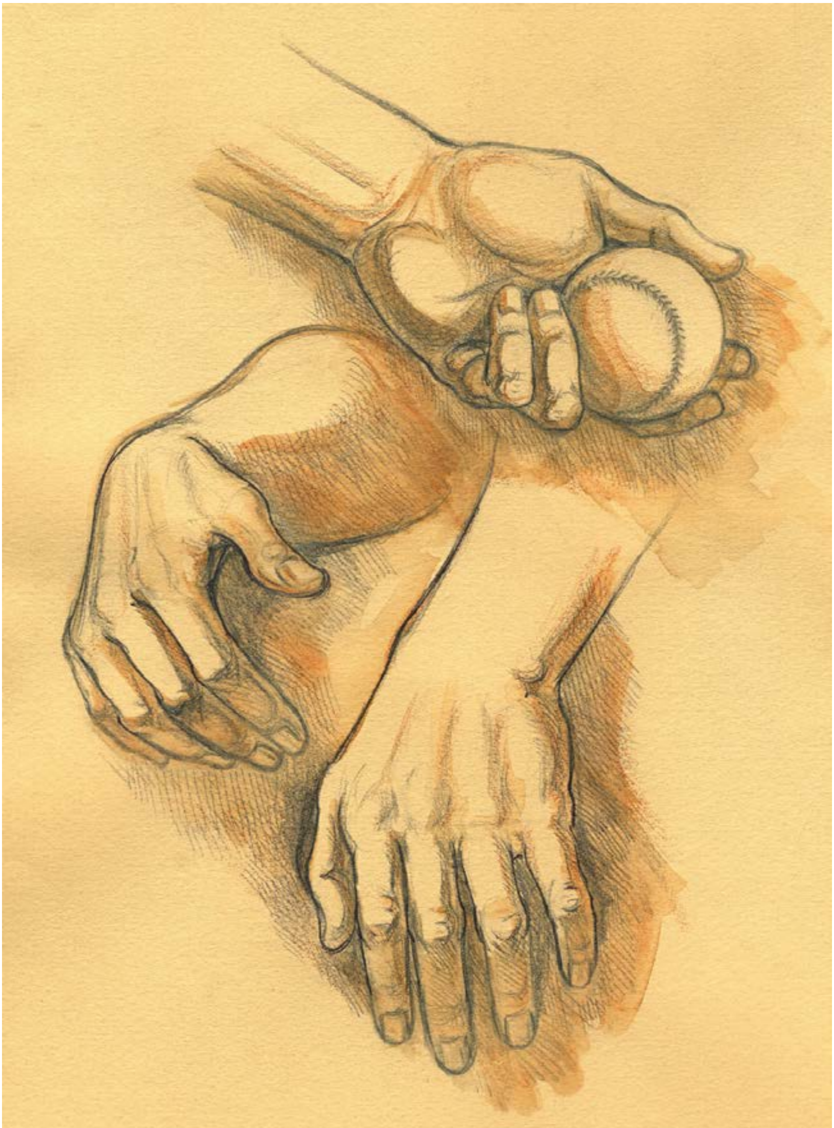
I recommend that you practice drawing hands in many positions—relaxed, dynamically positioned, or holding objects. After sketching the initial shape of the hand and fingers, add any anatomical forms (thenar and hypothenar muscle groups, triangle of the thumb, tendons, knuckles) that can be seen on the surface. Such studies can be done from your own non-drawing hand, other people's hands, or photo sources. The drawings in *Three Sketchbook Studies of Hands,* were done from a model holding his hands in different positions.

STUDY OF TWO HANDS—ONE HOLDING AN ACE CARD

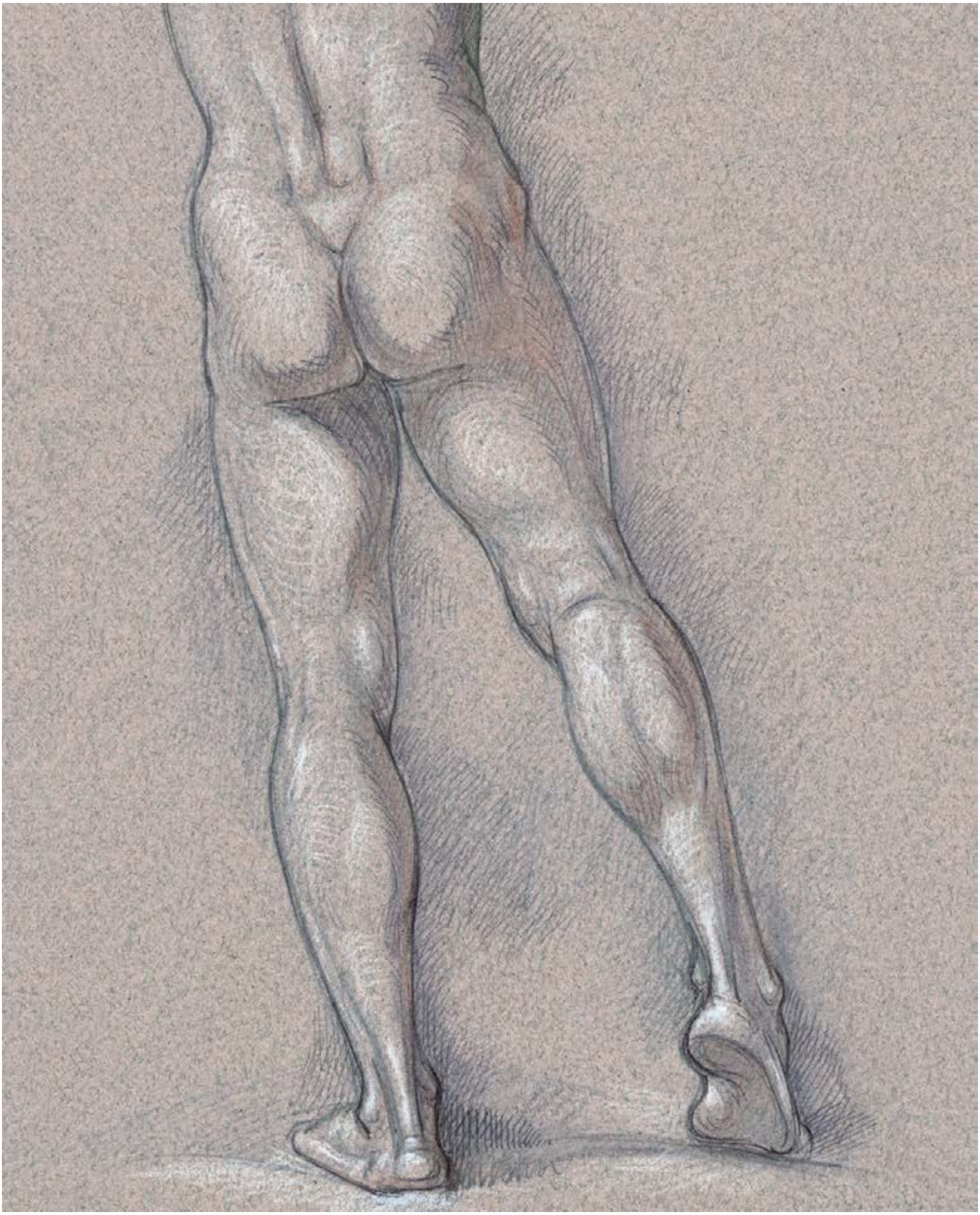


Graphite pencil, watercolor pencils, white chalk on toned paper.

THREE SKETCHBOOK STUDIES OF HANDS



Graphite pencil, ballpoint pen, and watercolor wash on toned paper.



MALE FIGURE WITH RIGHT LEG POSITIONED ON THE BALL OF THE FOOT

Graphite pencil, ballpoint pen, watercolor wash, and white chalk on toned paper.

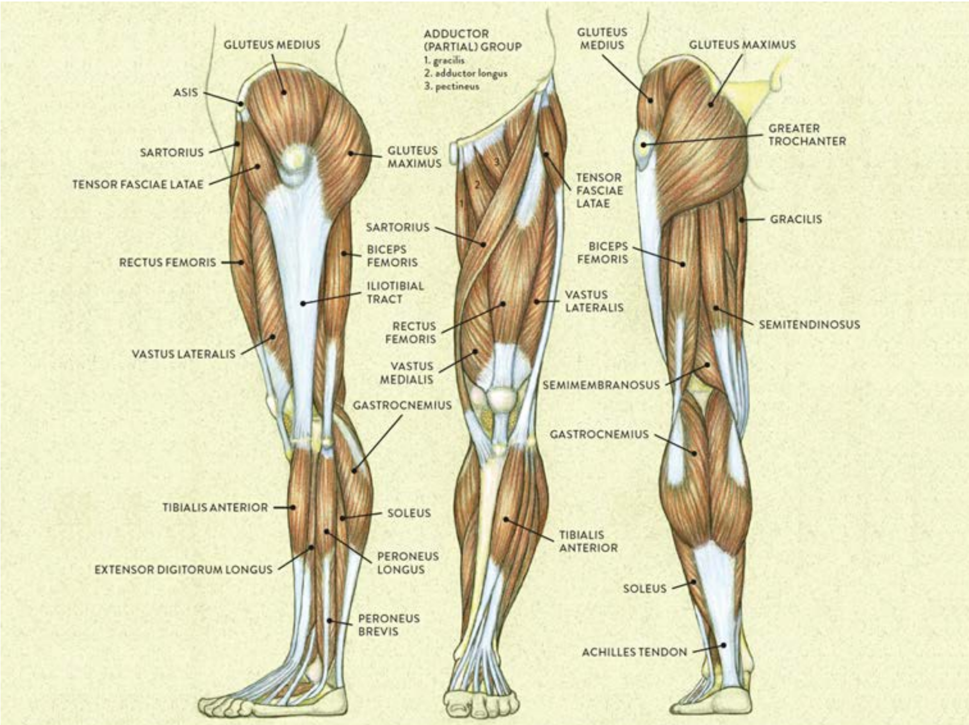
Chapter 7

Muscles of the Leg and Foot

Together, the upper and lower legs and the feet make up half the length of the human figure. Legs come in all shapes and sizes, ranging from portly and stout, to the streamlined, almost emaciated legs of runway models, to the muscular legs of athletes.

Artists usually begin their study of the legs by focusing on the athletic type, because the shapes of the muscles are more easily seen. But most people's legs are simple cylindrical forms with only a few distinct muscular shapes, such as the calf and quadriceps muscles. When depicting legs of this type, the emphasis can be placed on the rhythmic transition of forms throughout the leg. The drawings here provide a visual survey of the leg muscles.

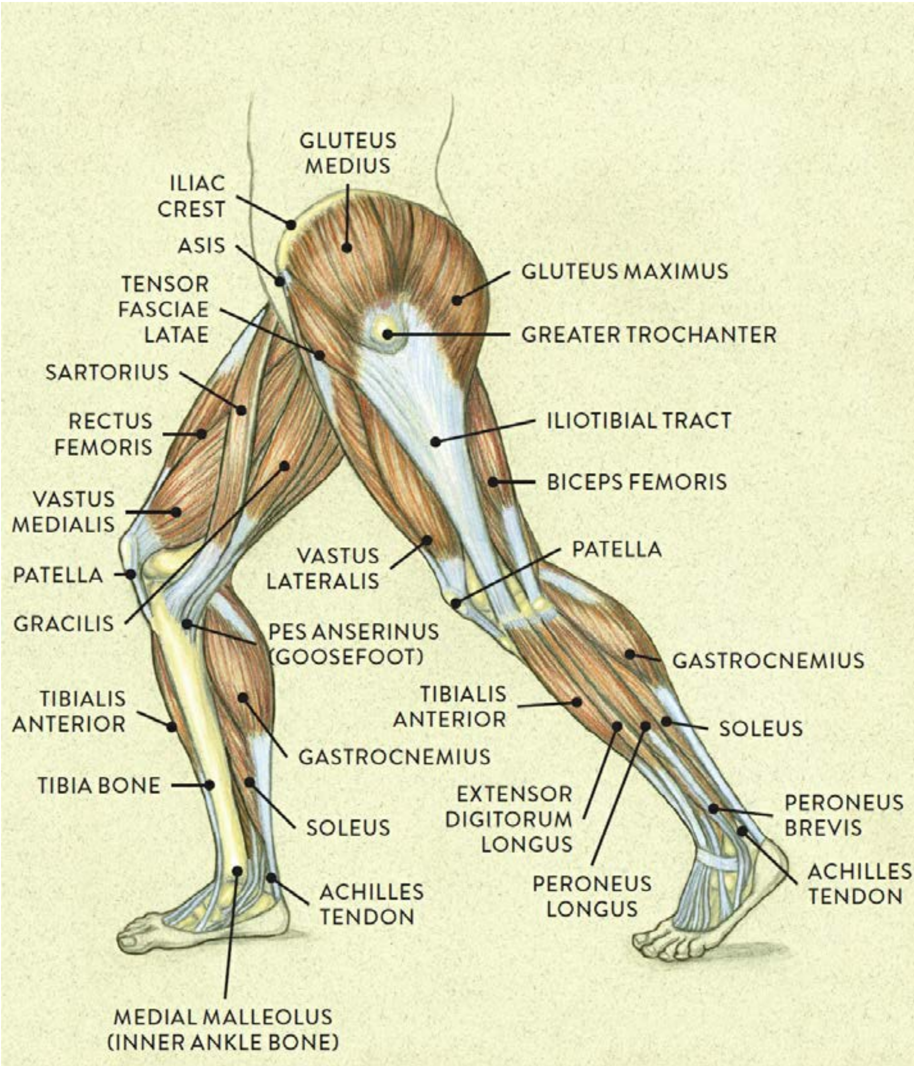
MUSCLES OF THE UPPER AND LOWER LEG



LEFT: Lateral view

CENTER: Anterior view

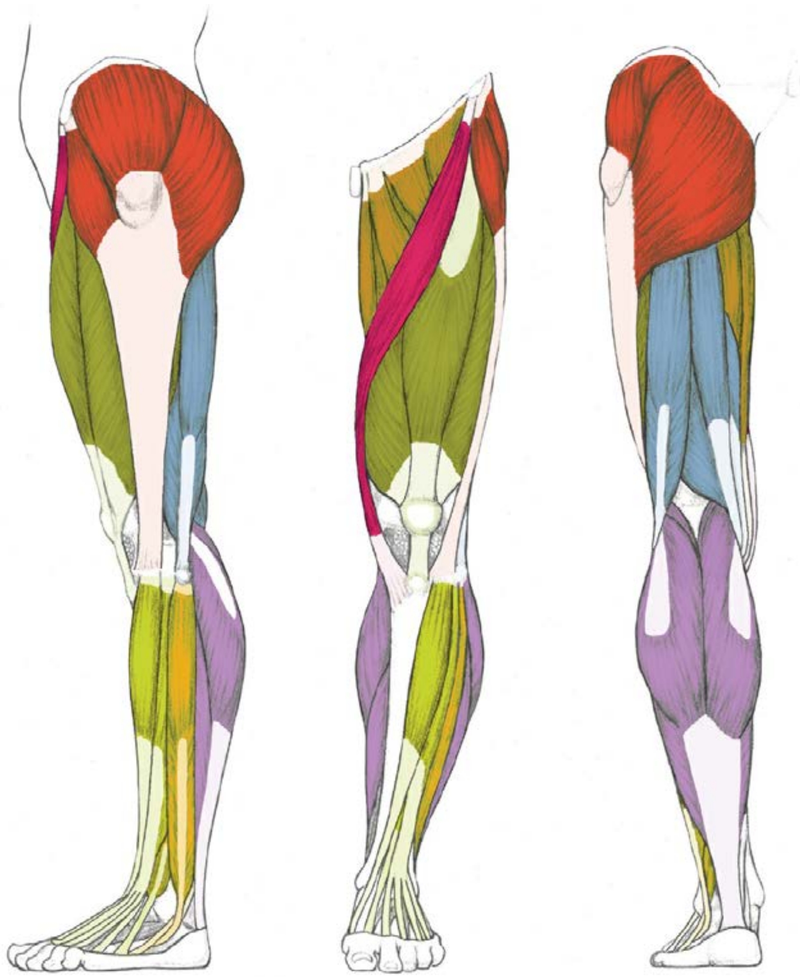
RIGHT: Posterior view



Lateral view of a pair of legs

As with muscles of other regions of the body, the various muscles of the upper and lower leg can be divided into groups. The muscle groups of the upper leg region are the *gluteal group,* the *quadriceps group,* the *adductor group,* and the *hamstring group.* Those of the lower leg are the *flexor group,* the *extensor group,* and the *peroneal group.*

MUSCLE GROUPS OF THE UPPER AND LOWER LEG



LEFT: Lateral view

CENTER: Anterior view

RIGHT: Posterior view

GLUTEAL GROUP

QUADRICEPS GROUP

ADDUCTOR GROUP

HAMSTRING GROUP

SARTORIUS

EXTENSOR GROUP

PERONEAL GROUP

FLEXOR GROUP

Names of Leg and Foot Muscles

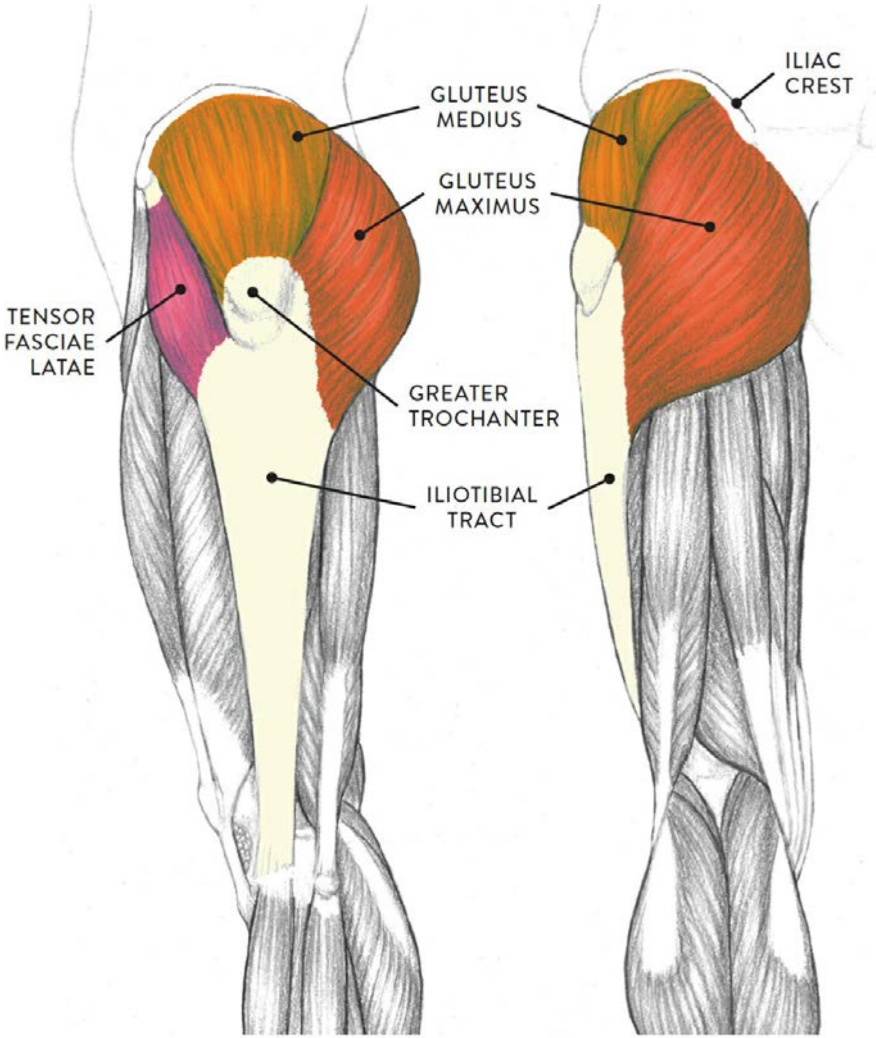
The names of leg and foot muscles provide clues to their location, function, shape, or size.

- *Anterior* means "of the front."
- *Intermedius* means "in between."
- *Lateralis* pertains to the outer (lateral) side of a body part.
- *Medialis* pertains to the median (as opposed to lateral) plane of a body part.
- *Medius* means "middle" or "in the middle."
- *Digiti* and *digitorum* pertain to the toes (digits).
- *Femoris* pertains to the femur bone.
- *Hallucis* pertains to the great toe.
- *Peroneus* pertains to the fibula bone.
- *Tibialis* pertains to the tibia bone.
- *Adductor* pertains to moving a body part toward midline.
- *Extensor* pertains to stretching.
- *Flexor* pertains to bending.

- *Rectus* means “straight.”
- *Brevis* means “short.”
- *Longus* means “long.”
- *Maximus* means “greatest” or “largest.”
- *Minimus* means “smallest.”
- *Vastus* means “of great extent.”

The Gluteal Muscle Group

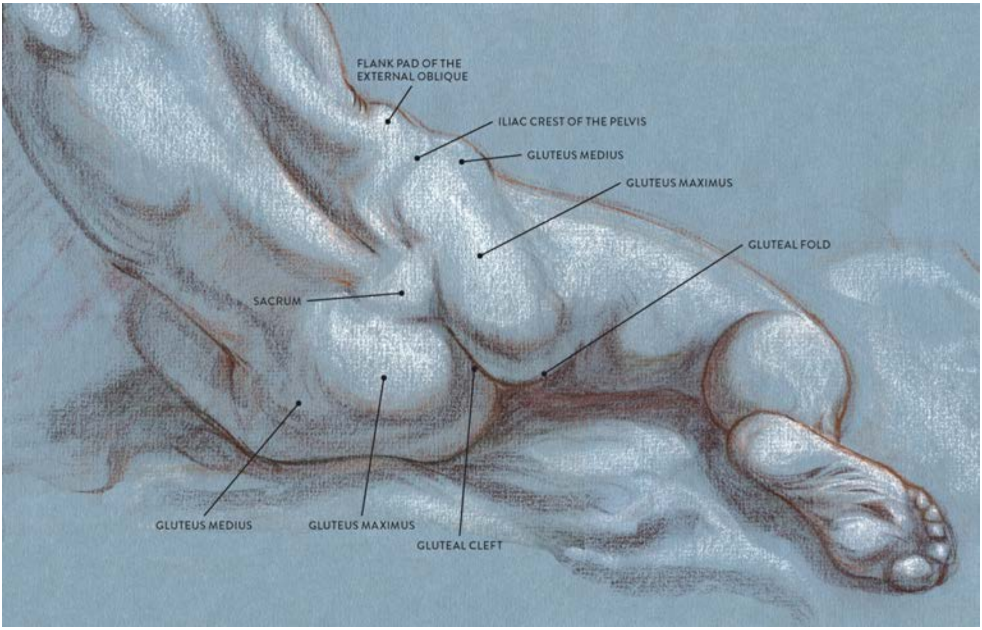
Let’s begin with a group of muscles that is part of both the torso and the legs: the gluteal (pron., GLOO-tee-ul) muscle group, shown in the following drawing. This group, occupying the lateral and posterior regions of the upper leg, primarily consists of four muscles that attach on the outer portion of the pelvis: the gluteus maximus, gluteus medius, gluteus minimus, and tensor fasciae latae. The gluteus minimus is not seen on the surface form because it is beneath the gluteus medius, but the other three muscles do appear as three separate shapes on muscularly developed legs. If there is a predominant layer of fatty tissue in this region, however, the gluteal group is seen as a single large mass. The gluteal group moves the upper leg (femur) at the hip joint.



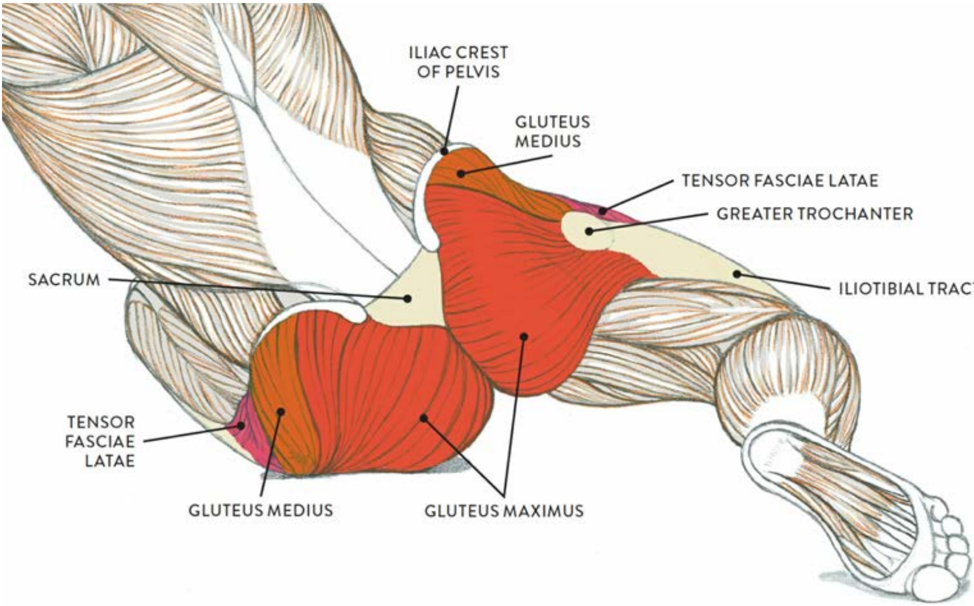
Left leg, lateral (left) and posterior (right) views

The following life study *Male Figure Sitting on the Floor,* shows a male figure whose hip muscles are well defined. The sacrum bone and the iliac crest of the pelvis—bony structures to which the muscles attach—are clearly seen. The accompanying muscle diagram reveals the positions of the muscles in this pose.

MALE FIGURE SITTING ON THE FLOOR

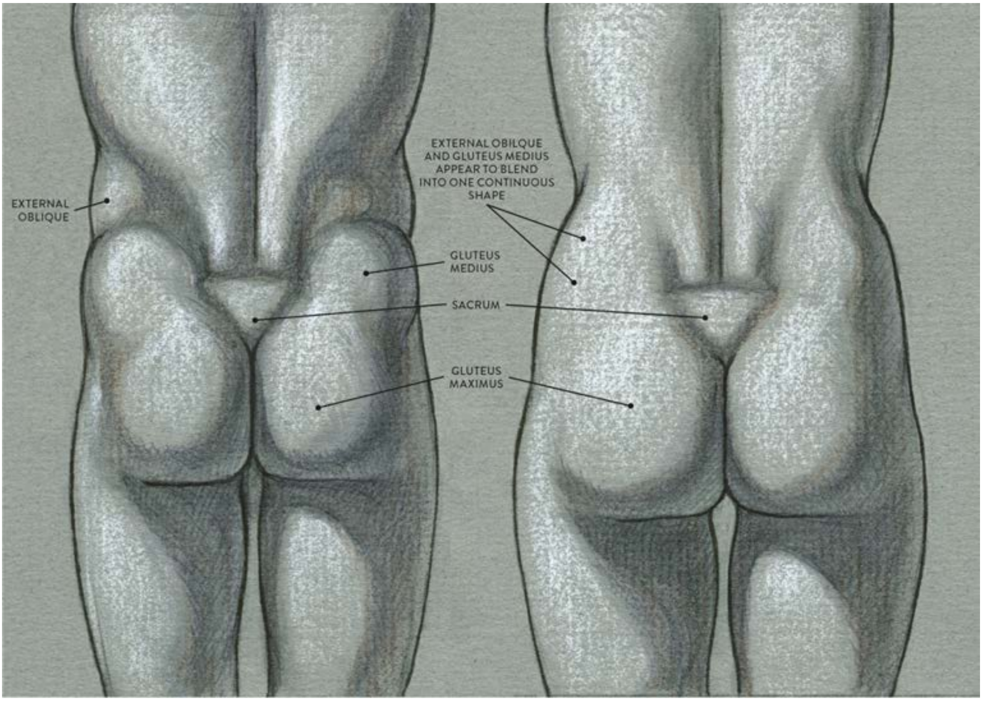


Sanguine and brown pastel pencils, white chalk on tone paper.



The sacrum bone is almost always noticeable, no matter what the body type, because it is not covered with muscles or substantial fatty tissue. It therefore serves the artist as a dependable visual landmark for the location of muscular forms. When viewed from the back, the shapes of the gluteus maximus and gluteus medius muscles are apparent on muscularly defined torsos, creating a butterfly shape. In torsos with a significant layer of fatty tissue, the gluteal muscles are softened into a single shape resembling a pear. In general, these shapes are characteristic of males and females, respectively, though there are many exceptions. You can use these shapes, shown in the drawings on this page, in gesture drawings, drawing them in very lightly to indicate the hips in an organic manner.

DIFFERENCES IN THE GLUTEAL MUSCLE GROUP—MALE AND FEMALE



LEFT: Male torso, posterior view

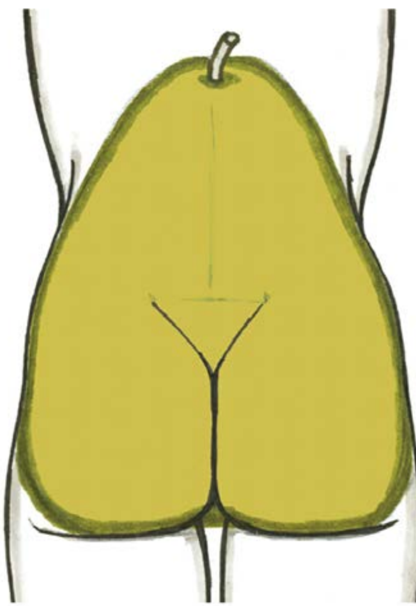
Muscle shapes are more apparent on the surface.

RIGHT: Female torso, posterior view

Muscles are covered by a thicker layer of subcutaneous tissue, softening the surface.

Male torso, posterior view

The combined forms of the gluteal muscles create a butterfly shape.



Female torso, posterior view

The gluteal muscle group and other soft-tissue forms of the female pelvis region are shaped like a pear.

The *gluteus maximus* (pron., GLOO-tee-us MACK-sih-mus) is the largest of the four gluteal muscles and dominates the hip region, especially in the posterior view. As the two muscles (left and right) swing away from each other near the bottom angle of the sacrum bone, they create a division called the *gluteal cleft.* When the upper leg is straight, a horizontal skin crease called the *gluteal fold* is seen on the lower border of the gluteus maximus; the fold disappears when the upper leg bends forward.

The gluteus maximus begins on the iliac crest of the pelvis and the outer edges of the sacrum and coccyx (tailbone) and inserts into the femur and the upper portion of the iliotibial tract. The iliotibial tract descends vertically down the outer side of the upper leg and eventually inserts into the lateral condyle of the tibia (large bone of lower leg). The gluteus maximus is the dominant extensor of the upper leg (femur). It bends the upper leg back from the hip joint (extension), and rotates the upper leg in an outward direction (lateral rotation).

The *gluteus medius* (pron., GLOO-tee-us MEE-dee-us) is a fan-shaped muscle that occupies the central portion of the pelvis bone. It is positioned between the tensor fasciae latae and gluteus maximus and appears as a prominent muscular bulge, especially when the muscle is contracting. This bulge should not be confused with the bulging form of the flank pad of the external oblique muscle, which is positioned directly above it on the side view of the torso. The iliac crest of the pelvis bone acts as a border between the two forms. If, however, there is substantial fatty tissue in this region, then the gluteus medius and the flank pad of the external oblique will appear as a single soft shape.

The gluteus medius begins on the outer surface on the ilium of the pelvis and inserts into the greater trochanter of the femur. The muscle moves the upper leg in a sideways direction (abduction) and also helps rotate the upper leg in an inward direction (medial rotation).

The *gluteus minimus* (pron., GLOO-tee-us MIN-ah-mus) is positioned on the central portion of the pelvis, beneath the gluteus medius. Even though this muscle is obscured from view by the gluteus medius, its fibers contribute to the bulging shape of the surface form in the side region of the pelvis. The muscle begins on the lower outer portion of the ilium and inserts on the greater trochanter of the femur. The gluteus minimus assists in the action of moving the upper leg away in a sideways direction (abduction) and helps rotate the upper leg inward (medial rotation).

The *tensor fasciae latae* (pron., TEN-sor FAA-shee-ee LAY-tee) is a teardrop-shaped muscle that begins on the ASIS of the pelvis and then flares slightly as it inserts into the fascia and upper portion of the iliotibial tract near the greater trochanter of the femur. Its shape is hard to detect on the surface form, although it can occasionally be seen as a small bulge in certain positions of the upper leg. When the leg is bent, or flexed, the tensor fasciae latae compresses so that the muscle fibers look as if they have a slight kink; on the surface, this compression appears as two egg-shaped forms. When

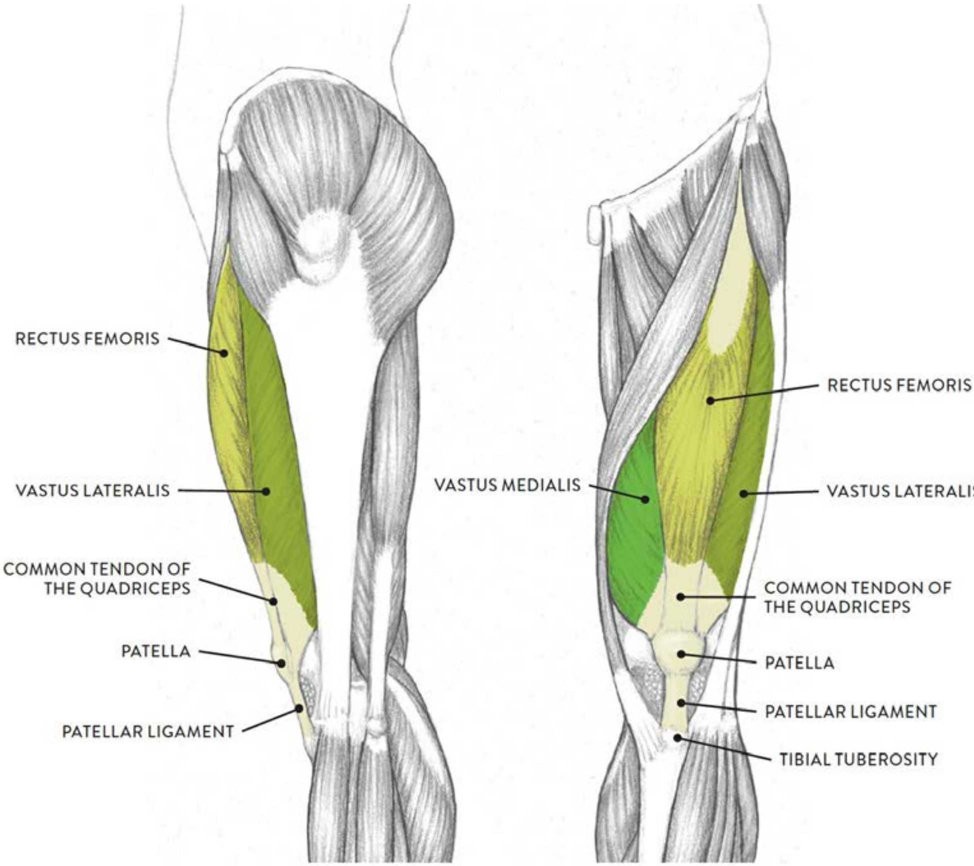
the leg extends, the muscle stretches into a narrow oval. The tensor fasciae latae helps move the upper leg in a forward direction (flexion), moves the upper leg in a sideways direction (abduction), and rotates the upper leg in a inward direction (medial rotation). It also helps tense the iliotibial tract.

Three Muscle Groups of the Upper Leg, with the Sartorius Muscle

Besides the gluteal group (which is also part of the torso region), there are three main muscle groups of the upper leg. The most prominent group on the anterior region of the leg is the quadriceps muscle group, also known as the *quadriceps femoris, quads,* or *extensor group of the upper leg.* Located on the medial (inner) portion of the upper leg is the adductor muscle group, sometimes referred to as the *inner thigh muscles.* Occupying the posterior region of the upper leg is the hamstring muscle group, also called the *flexor group of the upper leg.* An elongated muscle called the sartorius, which does not belong to any group, lies between the quadriceps and adductor groups. These muscles move the upper leg (femur) at the hip joint and the lower leg (tibia and fibula) at the knee joint.

The Quadriceps Muscle Group

The main muscle group on the anterior region of the upper leg is the quadriceps group (pron., KWAHD-drih-seps), shown in the drawing opposite. The term *quadriceps* means "four-headed" (Latin: *quad* = four, *ceps* = head). Some experts consider the quadriceps to be one muscle consisting of four parts, while others define the quadriceps as a group of four individual muscles. The latter, more traditional definition is the one I follow here.



Left leg, lateral (left) and anterior (right) views

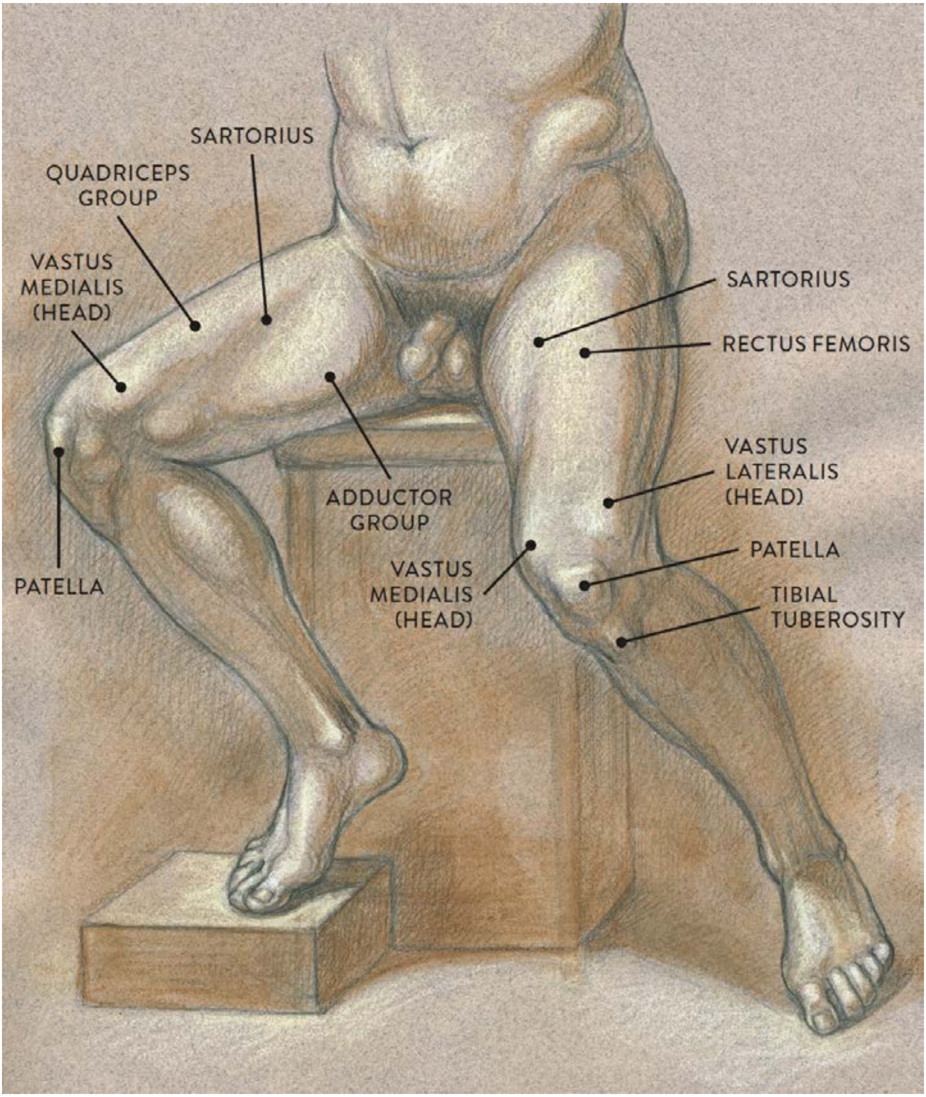
Three of the muscles (vastus lateralis, vastus medialis, and rectus femoris) are apparent on the surface form in muscular types, while the fourth (vastus intermedius) is always obscured from view. The borders of the quadriceps are the sartorius muscle (medial side) and the tensor fasciae latae muscle with the iliotibial tract (lateral side). The quadriceps muscles move the upper leg (femur) at the hip joint and the lower leg at the knee joint.

Each muscle of this group starts at four different locations on the femur and pelvis, and the muscles merge into one common tendon (*tendon of quadriceps*) that inserts into the patella (kneecap). The tendon continues past the patella to attach into the tibial tuberosity of the tibia; this latter segment of the tendon is usually called the *patellar ligament.* When depicting the knee region, it is essential for artists to locate the patella because it

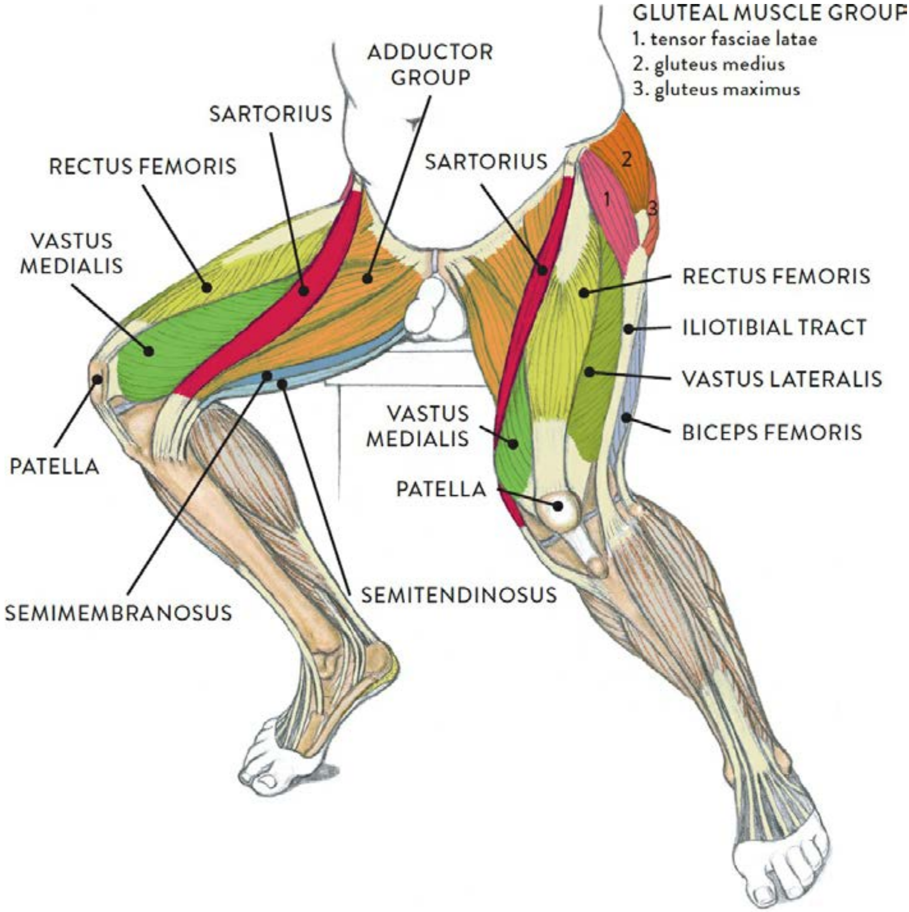
is the main anchoring site for the quadriceps muscle group.

The next life study, *Seated Male Figure with Robust, Muscular Legs,* focuses on the muscular forms of the anterior region of the upper legs. In it, you can see the quadriceps group, the adductor group, and the sartorious muscle between them. The accompanying muscle diagram further reveals the positions of the muscles in this pose.

SEATED MALE FIGURE WITH ROBUST, MUSCULAR LEGS



Graphite pencil, watercolor wash, and cream and white chalk on toned paper.



The *rectus femoris* (pron., RECK-tus FEM-o-riss, RECK-tus FEE-mor-iss, or RECK-tus fee-MORE-iss) occupies the central portion of the quads and is positioned over the vastus intermedius. The muscle begins near the ASIS of the pelvis directly above the acetabulum (hip socket). It inserts into the patella by way of the common quadriceps tendon, which continues on to the tibial tuberosity of the tibia. The rectus femoris helps straighten the lower leg at the knee joint (extension) and also helps bend the femur in a forward direction at the hip joint (flexion).

The *vastus lateralis* (pron., VAS-tus laa-ter-AL-iss) produces the thick mass of muscular form on the outer part of the upper leg and also forms a prominent bulge (the outer head) near the kneecap when the quadriceps muscle contracts. The muscle begins on the posterior side of the femur, near the greater trochanter. It inserts into the patella by

way of the common quadriceps tendon. The vastus lateralis straightens the lower leg at the knee joint (extension).

The *vastus medialis* (pron., VAS-tus mee-dee-AL-iss) is positioned on the medial portion (inner thigh) of the upper leg. When this muscle contracts, it produces a rich bulge near the kneecap, toward the inner part of the leg. The muscle begins on the posterior side of the femur, near the lesser trochanter. It inserts into the patella by way of the common quadriceps tendon. The vastus medialis helps straighten the lower leg at the knee joint (extension) and also helps stabilize the patella.

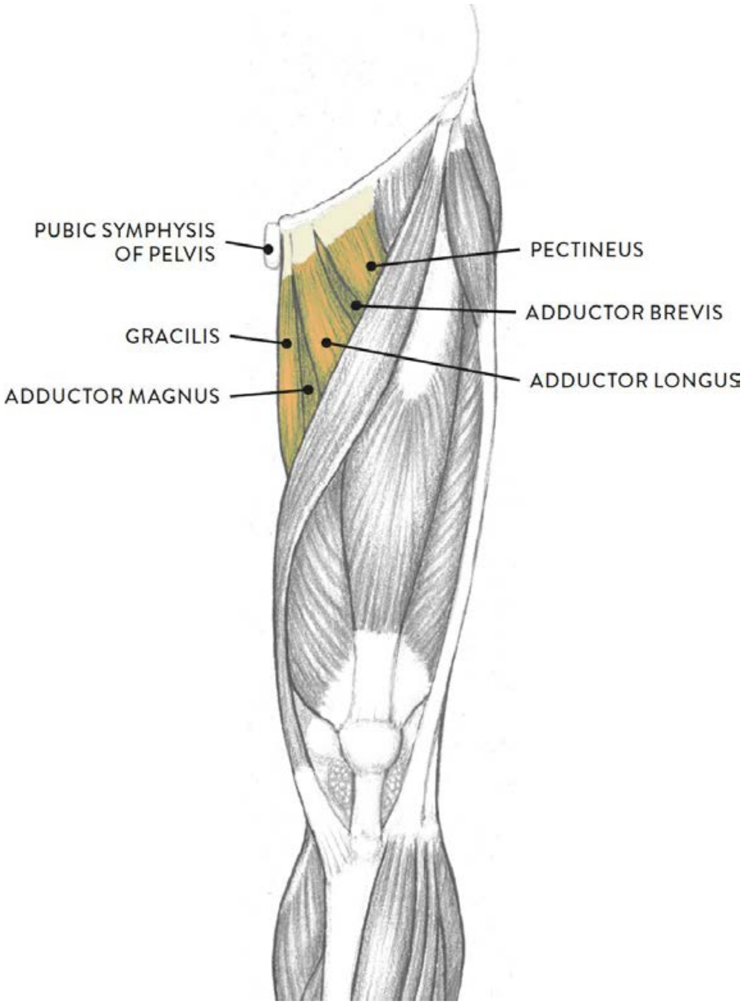
The *vastus intermedius* (pron., VAS-tus in-ter-ME-de-us) is positioned between the vastus lateralis and vastus medialis. This muscle is usually not seen on the surface form because the rectus femoris muscle is positioned on top, obscuring it from view. The muscle begins on the front and side portions of the femur. It inserts into the patella by way of the common quadriceps tendon. Like the other vastus muscles, the vastus intermedius helps straighten the lower leg from the knee joint (extension).

The Adductor Muscle Group

Located on the medial (inner) portion of the upper leg is a group of muscles called the adductor group, commonly known as the *inner thigh muscles.* The individual muscles of the adductor group are the *adductor magnus, adductor longus, adductor brevis, pectineus,* and *gracilis,* all shown in the drawing below. They contribute to the cylindrical shape of the upper leg and are not usually visible as separate muscles on the surface form.

Adductor Group Muscles Pronunciation Guide

MUSCLE	***PRONUNCIATION***
adductor brevis	ah-DUCK-tor BREH-viss
adductor longus	ah-DUCK-tor LON-gus
adductor magnus	ah-DUCK-tor MAG-nuss
gracilis	GRAH-suh-liss
pectineus	peck-TIN-ee-us



Left leg, anterior view

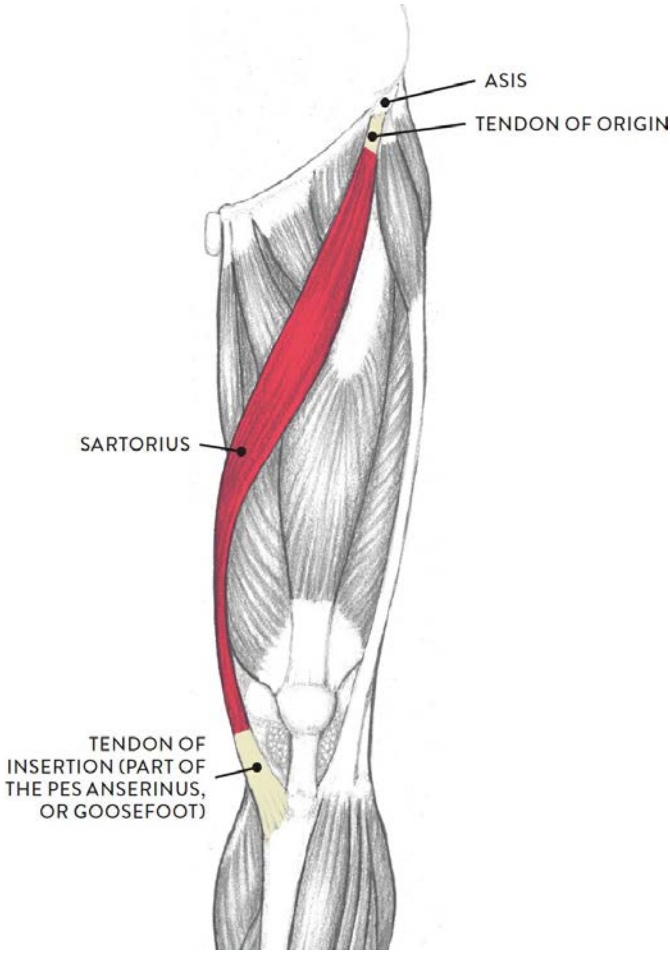
The individual muscles of the adductor group begin at various locations on the lower pelvis, including the ischium bone, the pubic bone, and the vicinity of the pubic symphysis. They insert along the whole back of the femur, while the gracilis muscle moves past the knee joint to attach into the tibia. As their name indicates, they mainly perform the action of moving an outstretched leg positioned sideways from the torso back to a normal standing position (adduction). Most of these muscles also help in bending the upper leg at the hip joint (flexion).

The Sartorius Muscle

The *sartorius* (pron., sar-TOR-ee-us), shown in the following drawing, is an elongated, straplike muscle positioned between the quadriceps and adductor muscle groups. It does not belong to any group of muscles. On athletic legs, both sides of the sartorius can usually be seen, while on average legs only the inner border of the sartorius is detectible, appearing as an elongated subtle indentation traveling diagonally on the thigh. When drawing this region, the indentation can be indicated with a soft tone or shadow.

The sartorius begins at the ASIS of the pelvis; its lower portion wraps snuggly around the inner condyles of both the femur and tibia and inserts into the medial condyle of the tibia. The tendon of the sartorius, along with other tendons, forms what is called the *pes anserinus,* meaning “goosefoot” because of its webbed appearance, resembling the foot of a goose. The serpentine rhythm of the sartorius, as it sweeps obliquely downward across the upper leg, is continued on the lower leg by the tibia, or shinbone, and this serpentine movement of both muscle and bone has been utilized by many figurative classical artists, past and present.

SARTORIUS

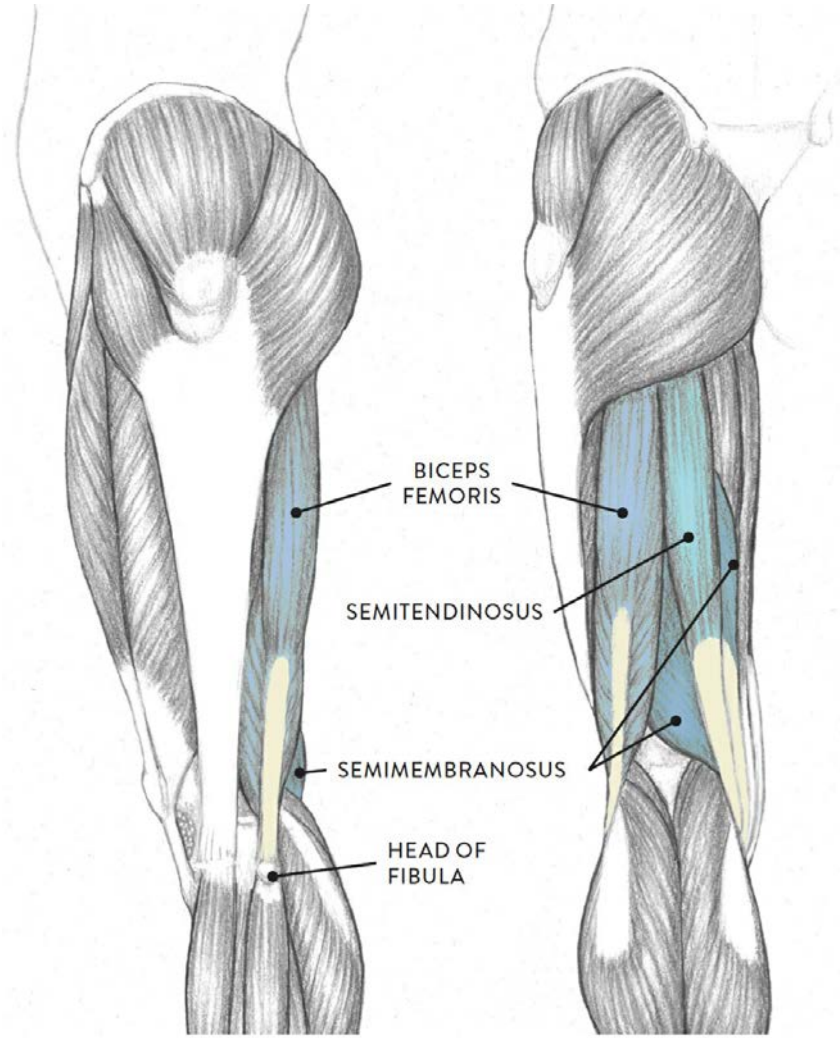


Left leg, anterior view

Contributing to many actions of the upper and lower leg, the sartorius helps move the upper leg in a forward direction from the hip joint (flexion), moves the upper leg in a side direction away from the midline of the body (abduction), rotates the upper leg in an outward direction (lateral flexion), and bends the lower leg at the knee joint (flexion of the knee).

The Hamstring Muscle Group

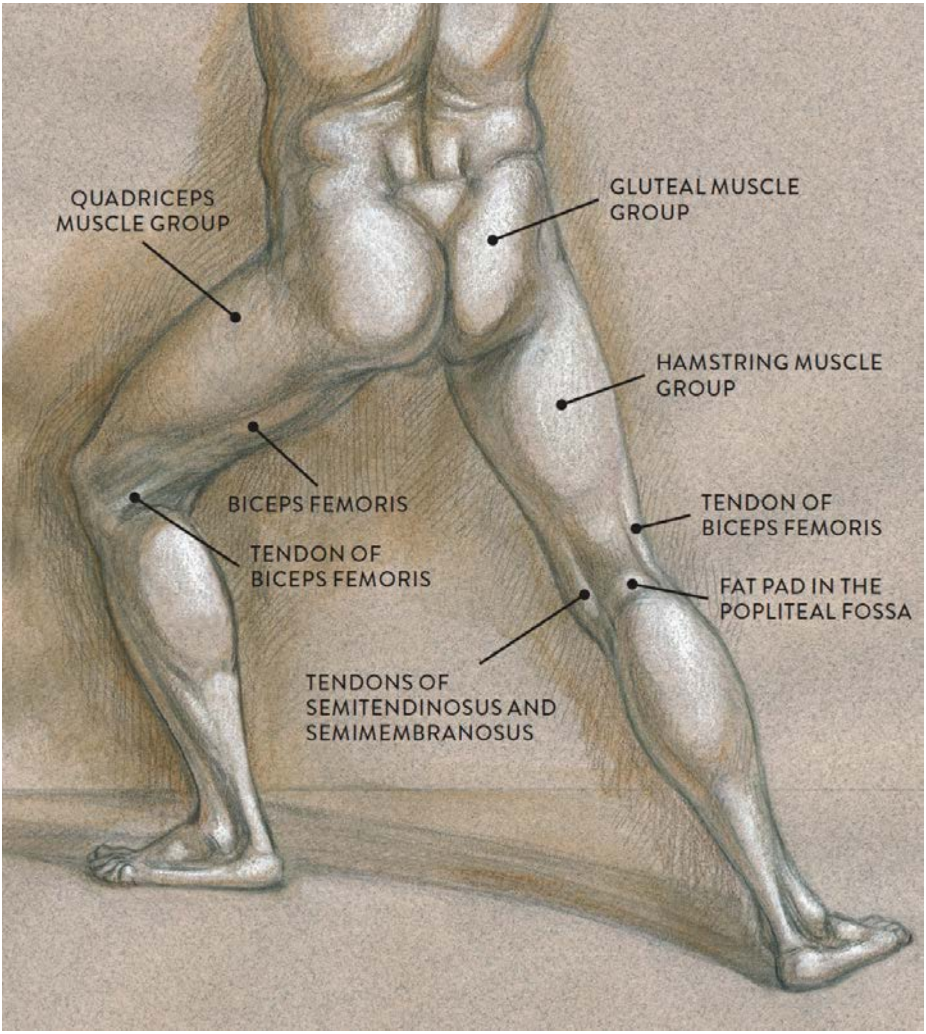
The hamstring muscle group, shown in the next drawing, consists of three muscles—the biceps femoris, semitendinosus, and semimembranosus—that occupy most of the posterior region of the upper leg. Usually, the hamstring group appears on the surface as a cylindrical shape, with little evidence of the individual muscles. Only on athletic legs can you see a slight furrow between the biceps femoris and the semitendinosus. The tendons of the hamstring muscles, however, do appear as "tongs" grasping the upper portions of the gastrocnemius (calf) muscle. Between the tendons is a space called the popliteal fossa, with a small fat pad. The hamstring muscles are flexors, moving the upper leg (femur) at the hip joint and the lower leg (tibia and fibula) at the knee joint.



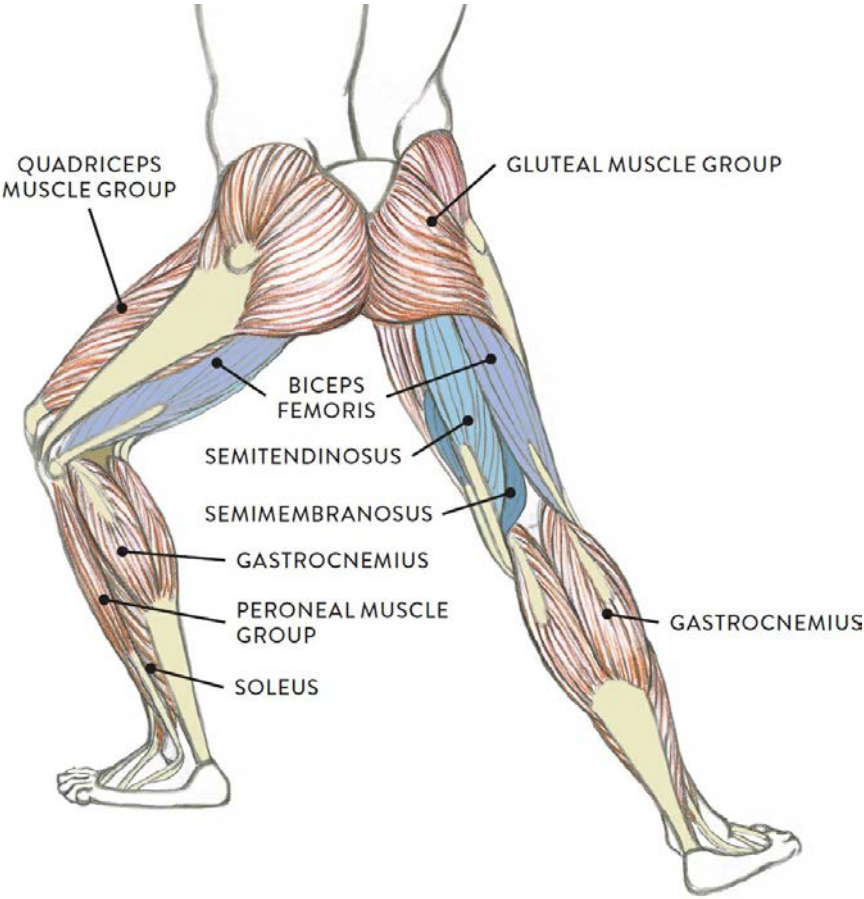
Left leg, lateral (left) and anterior (right) views

The following life study *Male Figure in a Lunging Pose,* shows a figure bending one leg while the other is outstretched. The accompanying muscle diagram further reveals where the muscles are positioned in this pose.

MALE FIGURE IN A LUNGING POSE



Graphite pencil, watercolor wash, and white chalk on toned paper.



The *biceps femoris* (pron., BI-seps FEM-or-iss) is positioned on the posterior and lateral portions of the upper leg. As its name implies, it has two heads (a long head and a short head), which usually appear as a single large form on the outer posterior region of the upper leg. The long head begins on the ischial tuberosity of the pelvis and the short head begins at the back of the femur. The powerful tendon of the biceps femoris, which produces a thick, cordlike form on the surface, inserts into the small, spherical head of the fibula. The biceps femoris bends the lower leg at the knee joint (flexion of lower leg), rotates the lower leg in an outward direction when the knee is bent (lateral rotation of lower leg), and straightens the upper leg at the hip joint (extension).

The *semitendinosus* (pron., SEM-ee-TEN-dih-NO-sus or seh-MY-ten-din-OH-sus) is positioned on the posterior and medial portions of the upper leg. The muscle begins on

the ischial tuberosity of the pelvis. Its tendon and the tendon of the semimembranosus are side by side and attach on the medial side of the tibia bone. The semitendinosus helps bend the lower leg at the knee joint (flexion of the lower leg), rotates the lower leg in an inwardly direction (medial rotation, but only when the knee is bent), and helps straighten the upper leg at the hip joint (extension).

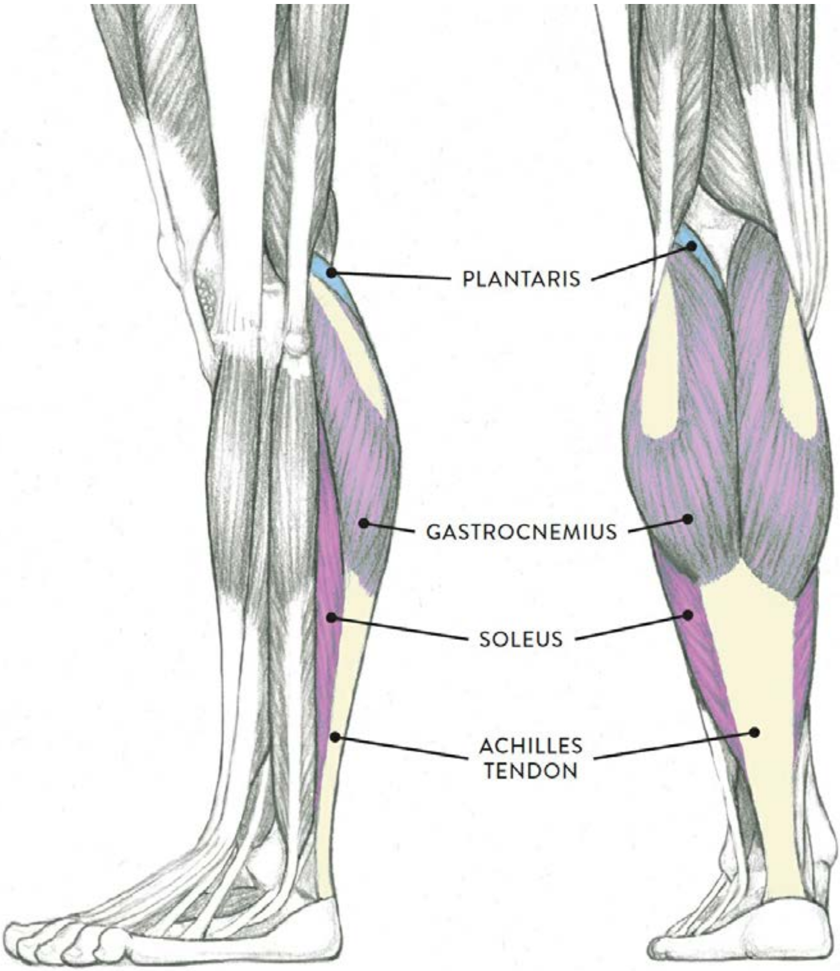
The *semimembranosus* (pron., SEM-ee-mem-brah-NO-sus or seh-MY-mem-bran-OH-sus) is mostly covered by the semitendinosus and is hard to detect on the surface of an average leg, although occasionally a small bulge will appear near the back of the knee region. The muscle begins on the ischial tuberosity of the pelvis and inserts on the posterior surface of the inner condyle of the tibia. The semimembranosus helps bend the lower leg at the knee joint (flexion of the lower leg) and rotates the lower leg in an inward direction (medial rotation, but only when the knee is bent). It also helps straighten the upper leg at the hip joint (extension).

Three Muscle Groups of the Lower Leg

Muscles of the lower leg move the lower leg at the knee joint and the foot at the ankle joint. There are three main muscle groups. The most prominent is the *flexor muscle group of the lower leg,* commonly known as the *calf muscles,* located on the posterior region of the lower leg. Situated on the anterior portion of the lower leg is the *extensor muscle group of the lower leg,* and occupying the lateral (outer) region of the lower leg is the *peroneal muscle group.*

The Flexor Muscle Group of the Lower Leg

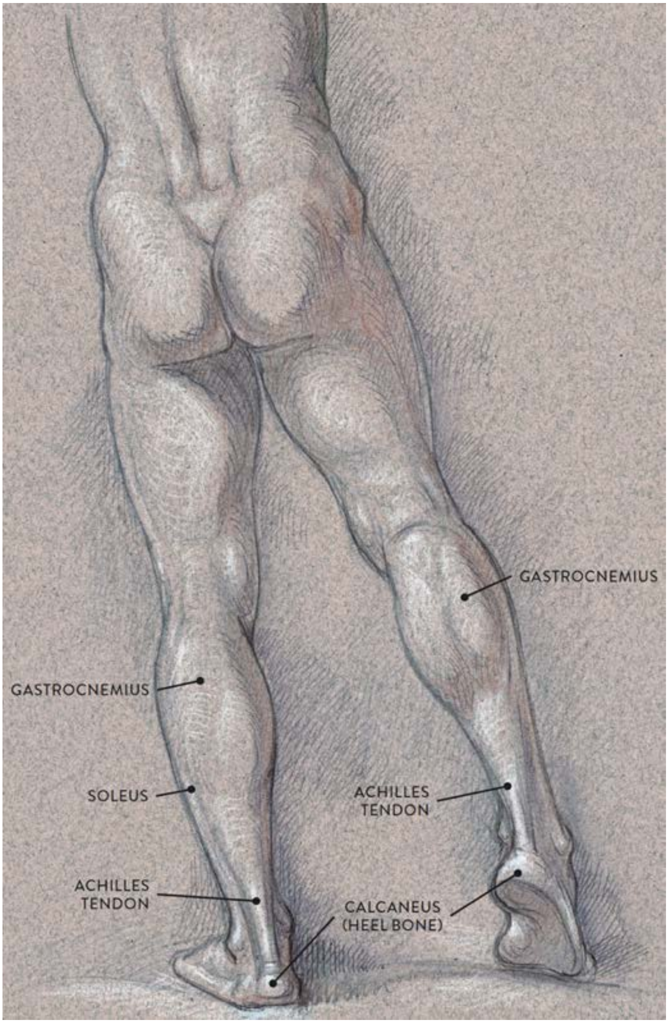
The flexor group occupies the posterior region of the lower leg, as shown in the next drawing. The group consists of the two-headed gastrocnemius muscle, the soleus muscle, and a smaller muscle called the plantaris. An older term—*triceps surae* (pron., TRI-seps SHUR-ay), which means "the three-headed muscle of the calf"—refers to both the gastrocnemius (with its two heads) and the soleus but not the plantaris muscle. The flexor group muscles move the lower leg (tibia) at the knee joint and the foot at the ankle joint.



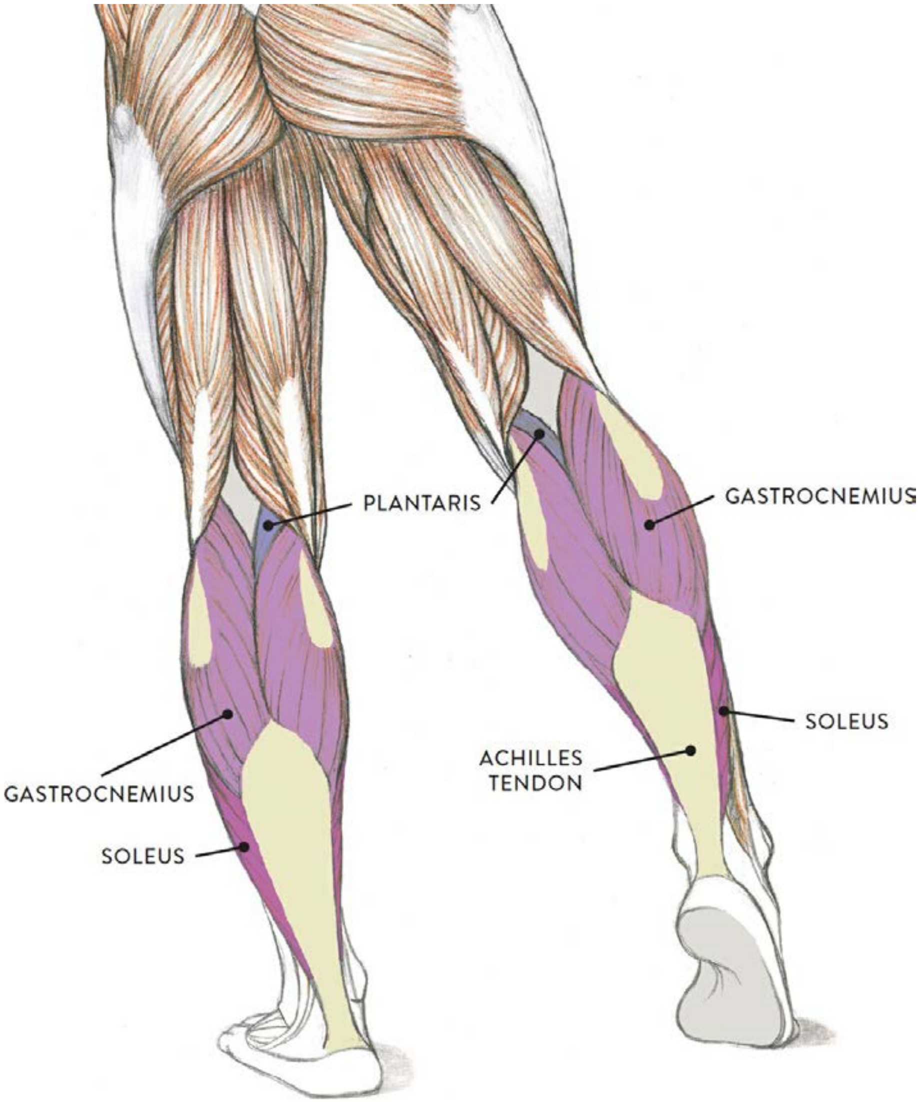
Left leg, lateral (left) and posterior (right) views

In the following life study *Male Figure with Right Leg Positioned on the Ball of the Foot,* you can see the rich bulging shape of the gastrocnemius muscle with its tendon (the Achilles tendon) appearing as a thick cord as it inserts into the heel. The accompanying muscle diagram shows the locations of the various surrounding muscles.

MALE FIGURE WITH RIGHT LEG POSITIONED ON THE BALL OF THE FOOT



Graphite pencil, ballpoint pen, watercolor wash, and white chalk on toned paper.



The *gastrocnemius* (pron., gas-trock-NEE-mee-us), more commonly known as the *calf muscle,* is an impressive oval muscular shape occupying the upper half of the lower leg in the posterior region. The two heads of the gastrocnemius begin on the large condyles of the femur—the lateral head on the lateral condyle and the medial head on the medial condyle. The muscle fibers merge into a common tendon, which inserts into the

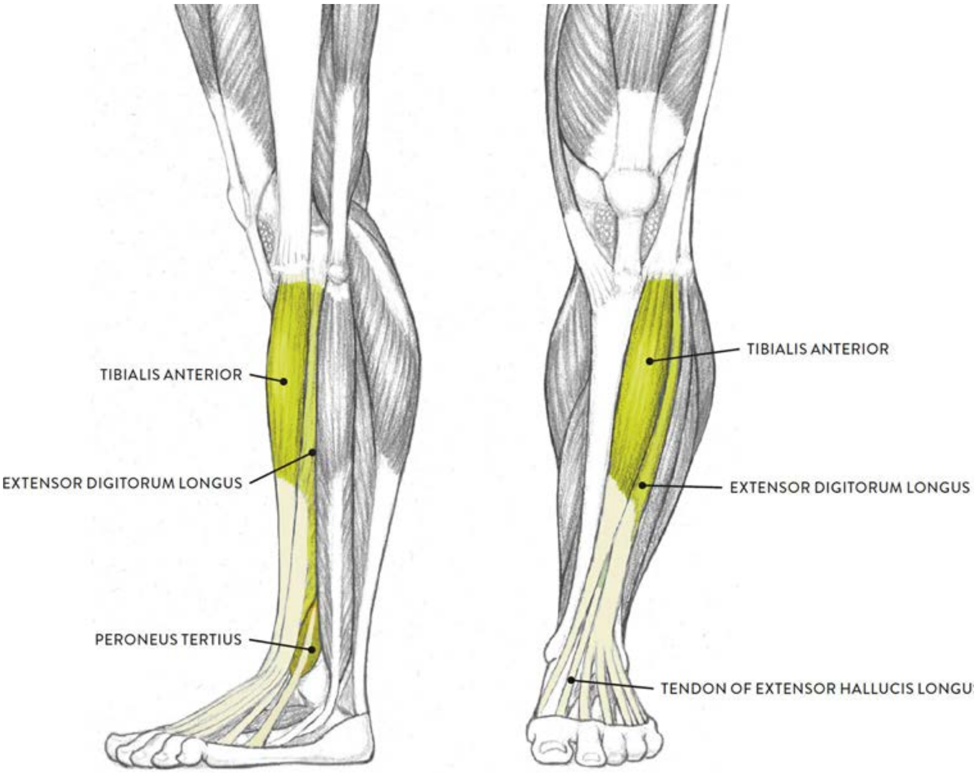
calcaneus of the foot (heel bone). Its tendon appears as a neutral area until it converges into the thick cordlike form known as the Achilles tendon. The tendon serves as an important landmark for artists as it flows downward from the rich shape of the calf to eventually anchor into the heel bone. The gastrocnemius helps bend the lower leg at the knee joint (flexion of the lower leg). When it contracts it also helps raise the heel, which is seen in the action of pointing the foot (plantar flexion) and in the tiptoe position.

The *soleus* (pron., SO-lee-us or SOL-ee-us) is positioned beneath the gastrocnemius; only its outer and inner borders appear on the surface, as elongated muscular ridges. The soleus shares the same broad tendon with the gastrocnemius. The muscle begins on the fibula, near the head and upper surface of the shaft, as well as on the tibia and the interosseous membrane. It inserts into the calcaneus (heel bone) by way of the Achilles tendon. The soleus helps raise the heel in walking, in standing on tiptoe, and in the action of pointing the foot downward (plantar flexion).

The *plantaris* (pron., plan-TARE-iss) is a small, somewhat flattened fusiform muscle with an extremely long, slender tendon. It is mostly covered by the lateral head of the gastrocnemius, with only a small portion being exposed near the popliteal fossa. Its presence is noticeable only on muscularly well-defined legs. The muscle begins on the lower part of the femur near the lateral epicondyle. Its tendon attaches into the calcaneus (heel bone). The plantaris's action is very weak, but it assists in bending the lower leg at the knee joint (flexion) and helps in raising the heel up, which is seen as the action of pointing the foot downward (plantar flexion).

The Extensor Muscle Group of the Lower Leg

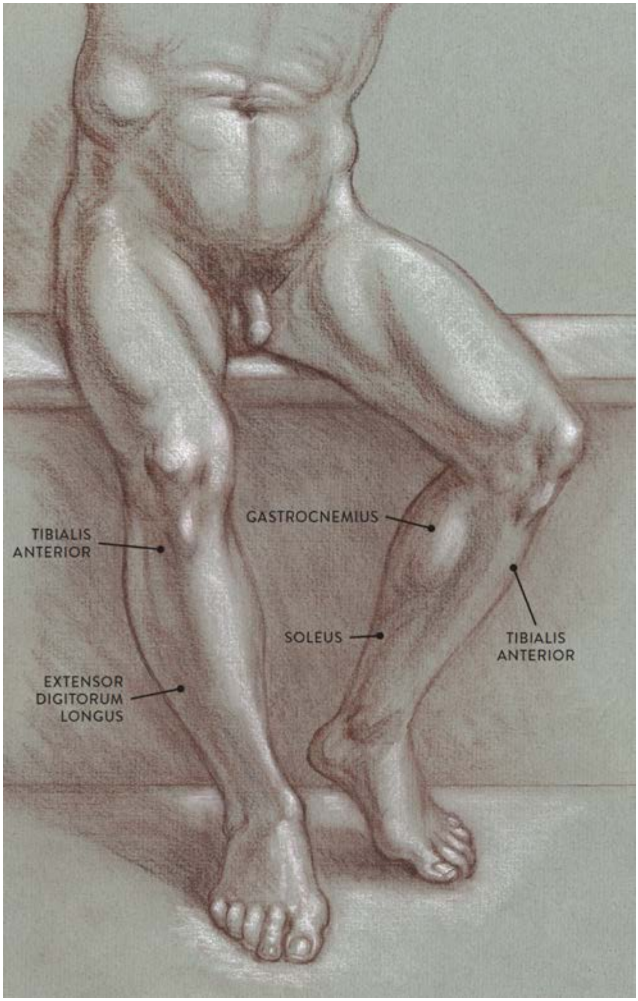
Positioned on the front portion of the lower leg, the muscles of the extensor group are the tibialis anterior, extensor digitorum longus, and extensor hallucis longus, as shown in the following drawing. The peroneus tertius also belongs to the extensor group, although its name might lead you to think that it is part of the peroneal group (see this page). The extensor group muscles help move the foot at the ankle joint and extend the toes.



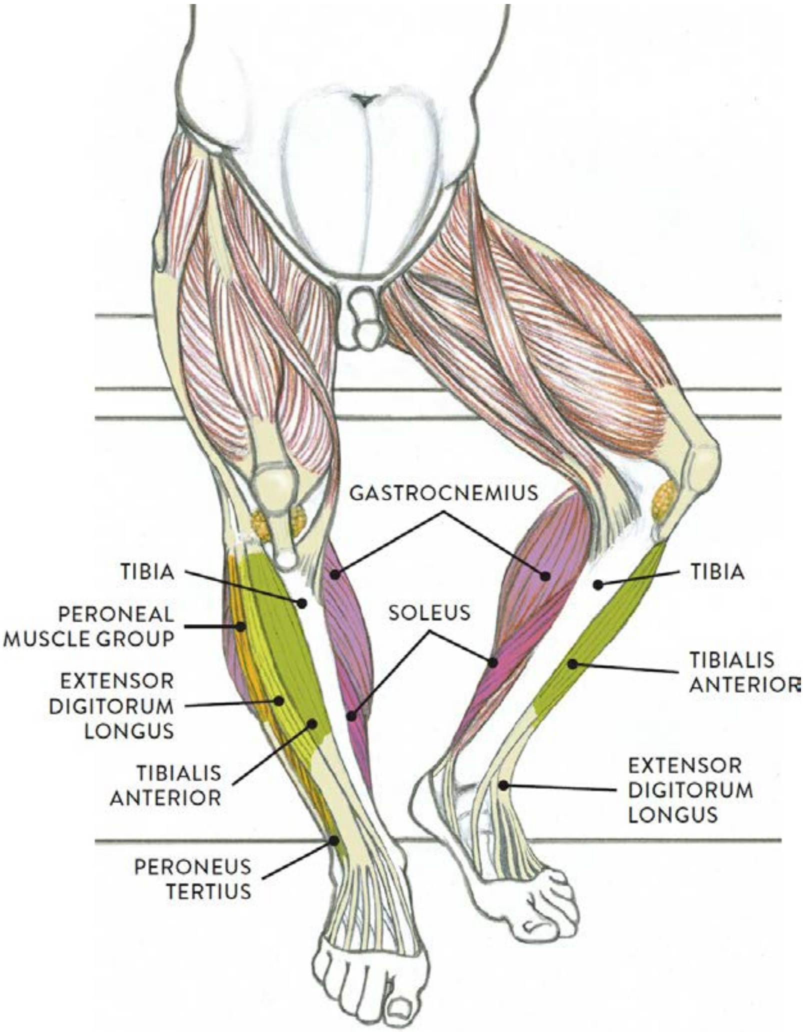
Left leg, lateral (left) and anterior (right) views

The following life study *Lower Torso and Legs in a Frontal View,* shows the lower torso of a male figure. The accompanying muscle diagram reveals the position of the muscles of the lower legs in this pose.

LOWER TORSO AND LEGS IN A FRONTAL VIEW



Sanguine and brown pastel pencils, with white chalk on toned paper.



The *tibialis anterior* (pron., tib-ee-AL-iss an-TEER-ee-or), also known as the *shin muscle,* is an elongated fusiform muscle that travels down the leg obliquely. Its cordlike tendon is noticeable near the inner ankle joint when the foot is lifted upward. The muscle begins on the tibia and the interosseous membrane. The elongated tendon of the tibialis anterior inserts on the side of the foot on the medial cuneiform tarsal bone and the base of the first metatarsal. The muscle raises the foot upward at the ankle joint (dorsiflexion) and turns the foot in an inward direction (inversion).

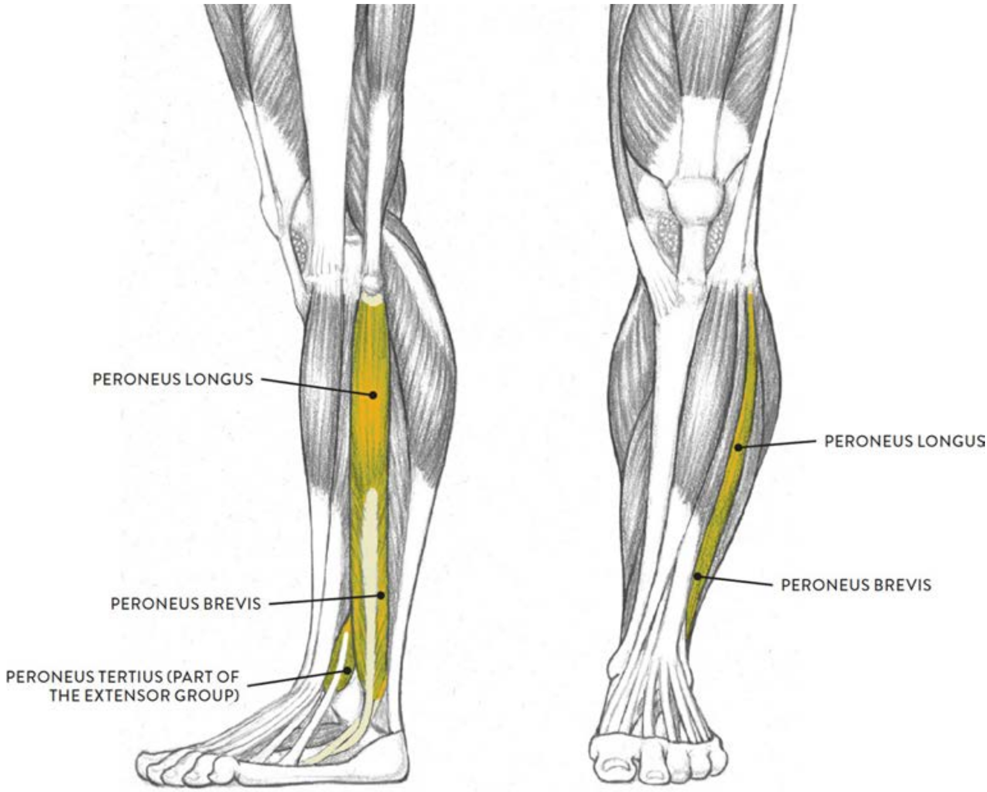
The *extensor digitorum longus* (pron., ek-STEN-sor dij-ih-TOR-um LON-gus) is a slender muscle positioned next to the tibialis anterior on the front of the lower leg. This muscle can appear as an elongated ridge on muscular individuals; on most people, however, it blends with the tibialis anterior. The extensor digitorum longus begins on the tibia and fibula and the interosseous membrane. About halfway down the lower leg the muscle fibers merge into a broad flat tendon, which then splits near the ankle joint into four individual tendons, each inserting into one of the four lesser toes. These tendons are detected on the surface when the toes are spread outward. The extensor digitorum longus raises the foot upward at the ankle joint (dorsiflexion) and also lifts the lesser toes upward (extension).

The *extensor hallucis longus* (pron., ek-STEN-sor HAL-loo-sis LON-gus or ek-STEN-sor HALL-luc-kiss LON-gus), commonly called the *great toe muscle,* is positioned beneath and between the tibialis anterior and the extensor digitorum longus. The great toe muscle begins on the fibula and the interosseous membrane. Its muscle fibers are usually not seen on the surface, but its cordlike elongated tendon is visible as it inserts into the large toe, especially when the muscle contracts, lifting the toe. (Many artists mistake this tendon for the tendon of the tibialis anterior, but the tibialis anterior's tendon, although positioned near the great toe's tendon at the ankle region, veers off to attach into the inner side of the foot.) The extensor hallucis longus raises the toe (extension of great toe) and also assists in lifting the foot upward (dorsiflexion).

The *peroneus tertius* (pron., pair-oh-NEE-us TER-shee-us), also known by the older name *fibularis tertius,* is anatomically part of the extensor muscle group, not the peroneal muscle group. The peroneus tertius begins on the front portion of the fibula and the lower part of the interosseous membrane and inserts into the fifth metatarsal of the foot. Like the peroneus muscles, it helps turn the foot in an outward direction (eversion). And like the extensor muscle group, it helps raise the foot upward from the ankle joint (dorsiflexion).

The Peroneal Muscle Group of the Lower Leg

The peroneal group consists of two muscles located on the lateral side of the lower leg: the peroneus longus and the peroneus brevis. Shaped like an elongated bootstrap, the peroneal muscles move the foot at the ankle joint and help stabilize the ankle. They appear as elongated muscular ridges that are more apparent on joggers, bicyclists, and others who use their lower leg muscles extensively.



Left leg, lateral (left) and anterior (right) views

The *peroneus longus* (pron., pair-oh-NEE-us LON-gus or pair-RONE-ee-us LON-gus) is the larger of the two peroneal muscles. It is a bipennate muscle with a long, slender tendon, which can be seen riding close to the edge of the fibula, where it wraps around the outer ankle before inserting into the foot. It begins on the head of the fibula and the lateral condyle of the tibia and inserts into the foot at the base of the first metatarsal and the medial cuneiform tarsal bone. The peroneus longus helps point the foot from the ankle joint (plantar flexion) and helps turn the foot outward (eversion).

The *peroneus brevis* (pron., pair-oh-NEE-us BREV-iss or pair-RONE-ee-us BREH-viss) is also a bipennate muscle. It begins on the lower two-thirds of the fibula and inserts into the base of the fifth metatarsal of the foot. Like its larger partner, it helps point the foot (plantar flexion) and helps turn the foot outward (eversion).

Muscles of the Foot

The foot is a fascinating structure, composed of many bones, ligaments, and cartilages; a few muscles; layers of tendons; and a large amount of fatty tissue that provides shock absorption. The drawing on this page shows the complexity of the foot's internal structures.

The dorsal (top) part of the foot contains the tendons descending from the muscles of the lower leg, each one continuing into a different toe. These tendons can at times be seen quite clearly, especially when the toes are spread apart (adduction of the toes). The only muscle located on the dorsal region of the foot is the *extensor digitorum brevis,* which appears as a small, soft, egglike form near the outer ankle bone (lateral mallelous of the fibula). It helps straighten the lesser toes (extension) and is activated in walking and running when the toes are pulled upward to clear the ground.

Muscles of the Foot Pronunciation Guide

MUSCLE	***PRONUNCIATION***
abductor digiti minimi	ab-DUCK-tor DIH-jih-tee MIN-ih-mee or ab-DUCK-tor DIJ-ih-tie MIN-ih-my
extensor digitorum brevis	ek-STEN-sor dij-ih-TOR-um BREV-iss
abductor hallucis	ab-DUCK-tor HAL-loo-siss or ab-DUCK-tor HAL-luc-kiss

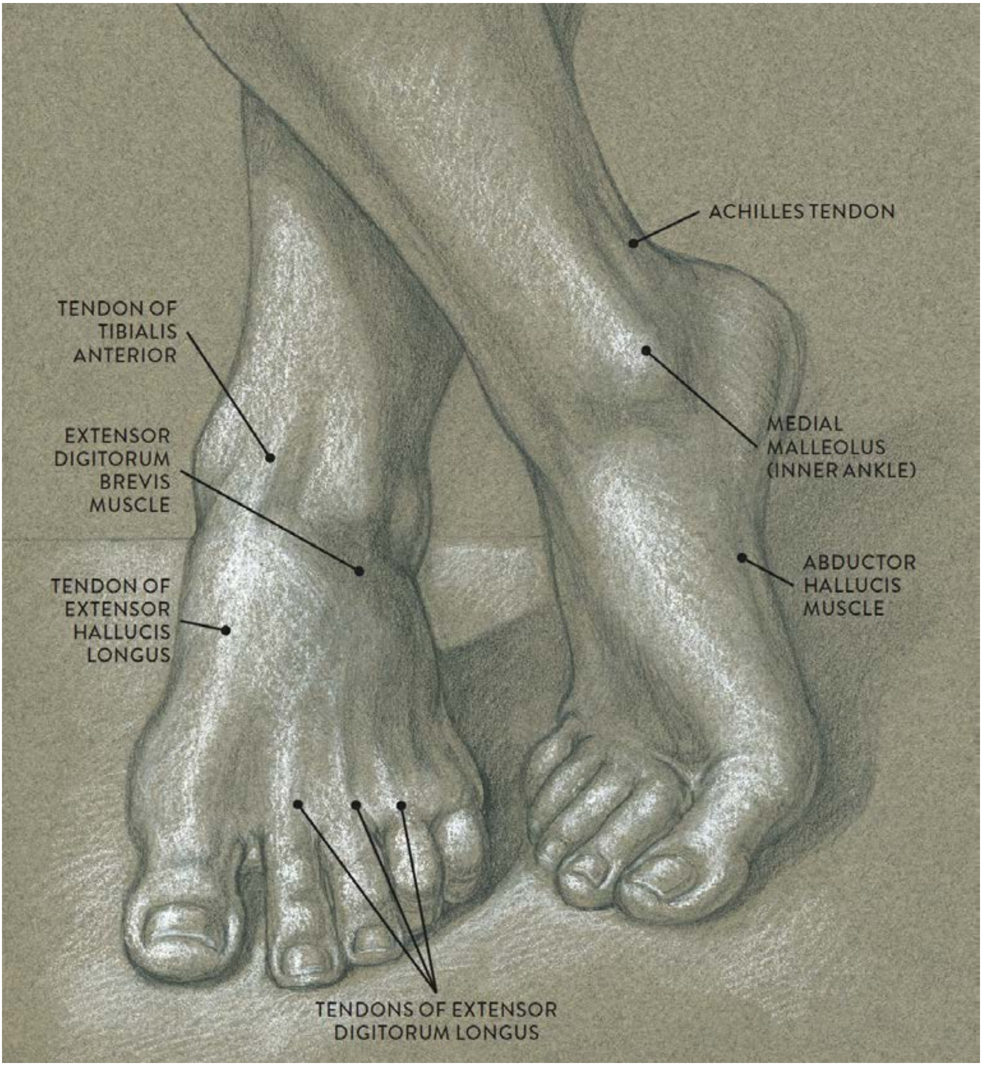
Along the outer edge of the foot, beginning near the fifth toe and terminating in the heel region, is the *abductor digiti minimi.* This narrow, streamlined muscle is padded with fatty tissue on its lower border and appears as a noticeable ledge along the outer region of the foot. When this muscle contracts, it pulls the little toe sideways from the foot (abduction) and also helps bend the little toe (flexion).

Another elongated muscle, the *abductor hallucis,* is attached along the inner arch of the foot and can be seen occasionally. When this muscle contracts it pulls the large toe sideways from the foot (abduction).

As with the hands, I recommend practicing drawing the feet in many different positions. Sketching the feet from various sources (master artists' paintings and sculpture, models' feet, photos) will help you gain confidence and skill when approaching these difficult forms. The studies can be gesture drawings (see this page) that quickly capture the general shape of the foot or longer studies, such as the ones to the

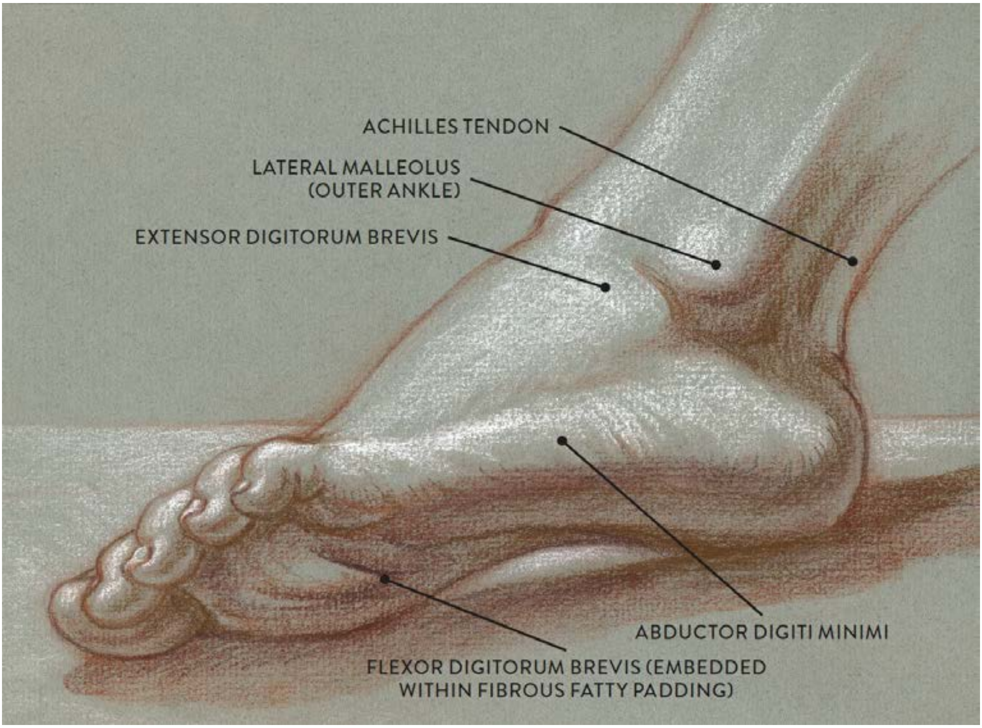
right, that emphasize the anatomical forms of the foot.

STUDY OF FEET



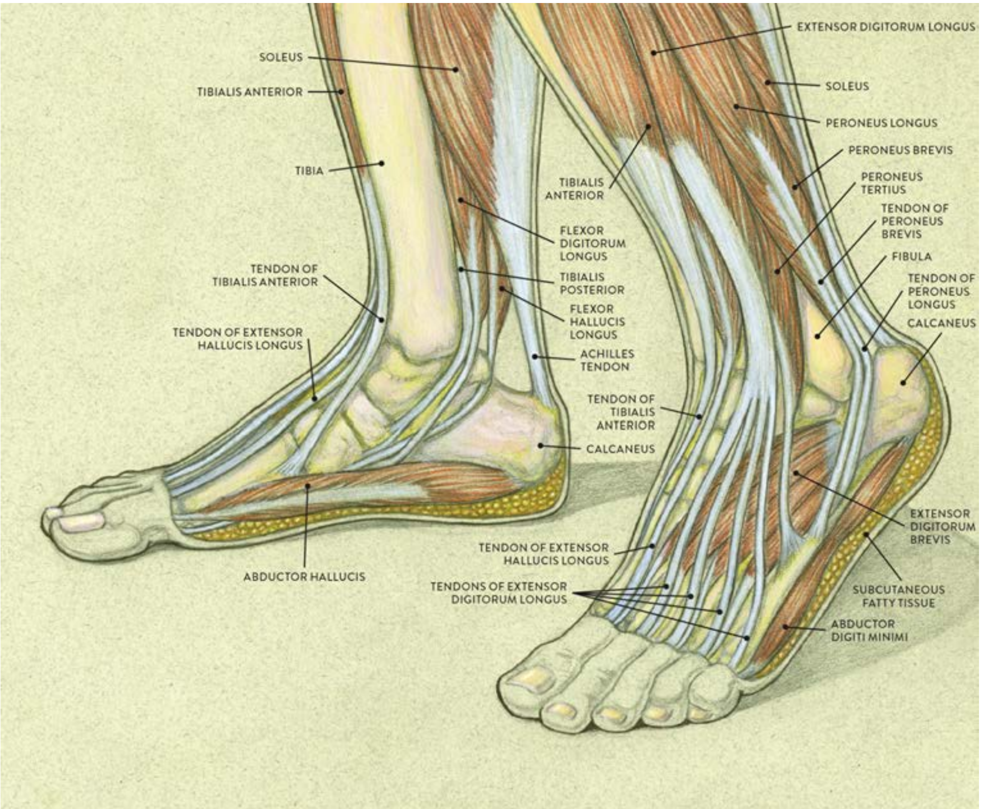
Graphite pencil and white chalk on toned paper.

STUDY OF A LEFT FOOT IN A LATERAL VIEW



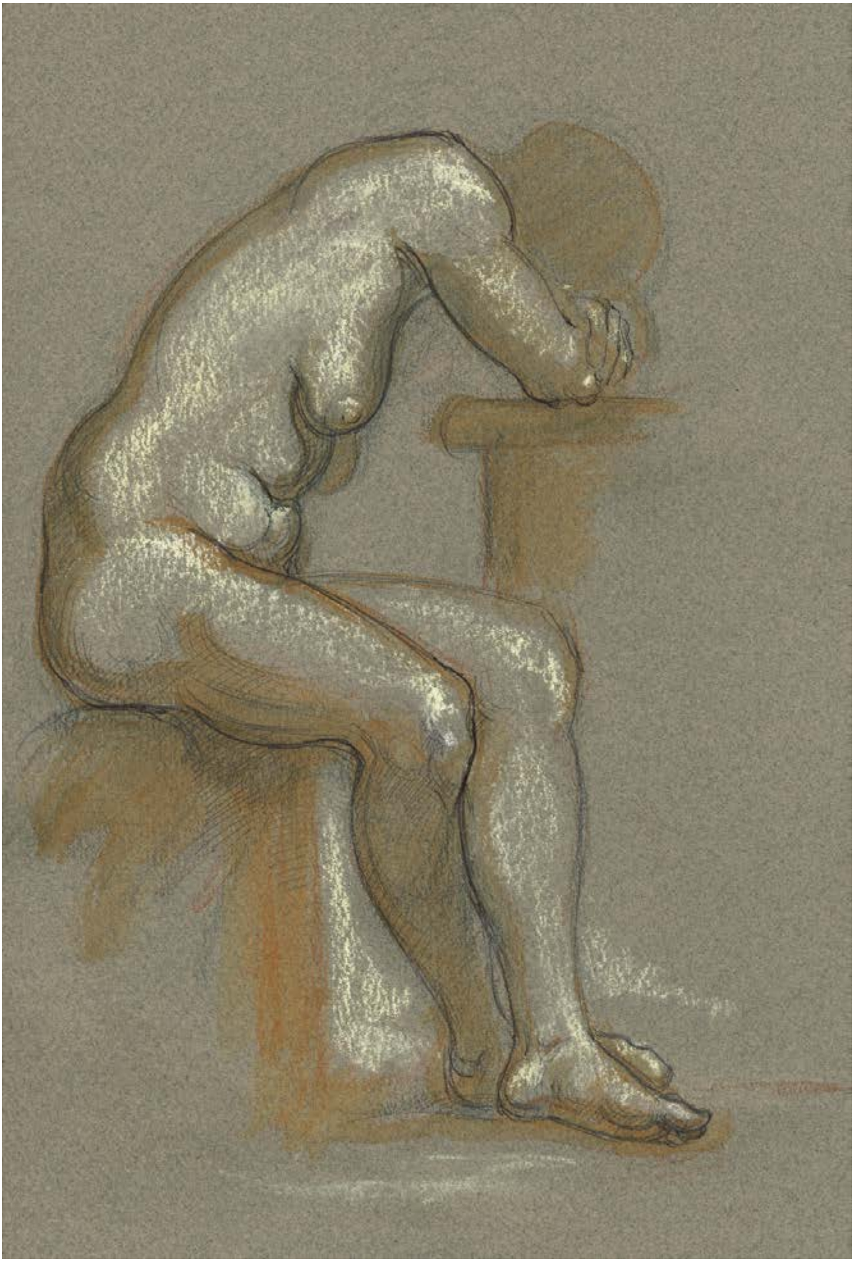
Sanguine and brown pastel pencils and white chalk on toned paper.

MUSCLES AND TENDONS OF THE FOOT



LEFT: Medial (inner side) view of right foot

RIGHT: Lateral (outer side) view of left foot



STUDY OF FEMALE FIGURE SITTING, SIDE VIEW

Graphite pencil, ballpoint pen, watercolor pencil, and white chalk on toned paper.

Chapter 8

Body Types, Surface Landmarks, and Soft-Tissue Characteristics

This chapter begins by briefly examining three basic body types, then goes on to explore other surface form characteristics to increase your understanding of the dynamics of the human figure. Surface form landmarks include the various bony landmarks mentioned in Chapter 1, as well as soft-tissue forms that influence the surface shape, including muscles, fatty tissue, tendons, cartilages, and ligaments that collectively produce a variety of eminences, depressions, furrows, creases, and folds in the skin throughout the body.

During certain actions, some soft-tissue landmarks may be quite noticeable, becoming harder to detect when the body or body part changes position. When drawing the figure, it is not necessary to include every surface characteristic you see in each pose. You may choose to emphasize, downplay, or edit surface landmarks depending on your interpretation and on the movement or feeling you want your drawing to convey.

Basic Body Types

The endless variation of human bodies makes the study of the figure challenging as well as captivating. People come in a wide assortment of shapes and sizes—petite, portly, slender, muscular—and all these different body shapes are influenced not only by skeletal and muscle characteristics but also by the subcutaneous layer, which contains adipose (fatty) tissue. Among other factors contributing to differences in body shapes are genetic makeup, the aging process, and glandular influences. Alterations to the shape of the body can also result from illness, bone deterioration, and malnourishment. Some factors' influence is inevitable, as with aging. However, the amount and distribution of fatty tissue and the tone of muscles can be changed intentionally through bodybuilding, dieting, cosmetic surgery, or disciplined training in sports, martial arts, or dance.

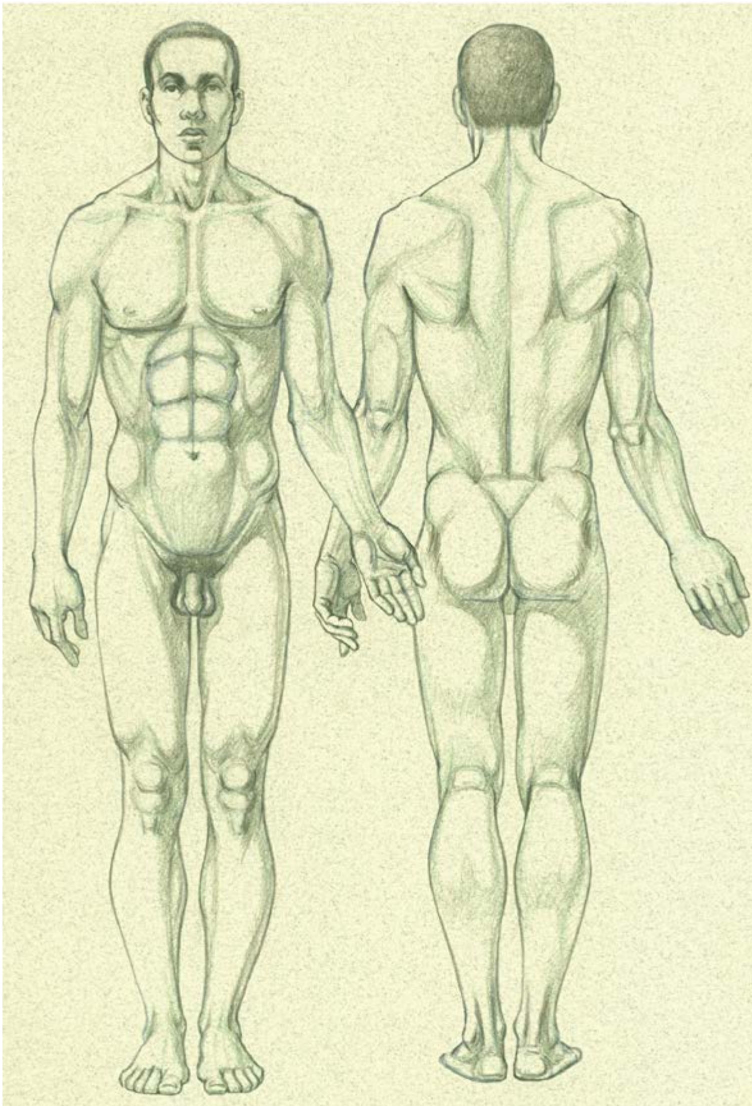
One system of identifying different body types that has been used for decades states that there are three basic body types—*mesomorph, ectomorph,* and *endomorph*—each with its own particular characteristics. These types are, of course, generalizations. Most people's bodies have attributes of all three types, with one type predominating. While this system is not totally reliable and might possibly lead to stereotyping, it is useful for learning purposes.

The Mesomorph Body Type

The mesomorph has a naturally athletic build, with large bones and well-defined muscular forms. The chest tends to be wide, the neck thick, and the face angular in appearance. Basic traits of the mesomorph—male and female—are shown in the drawing on this page.

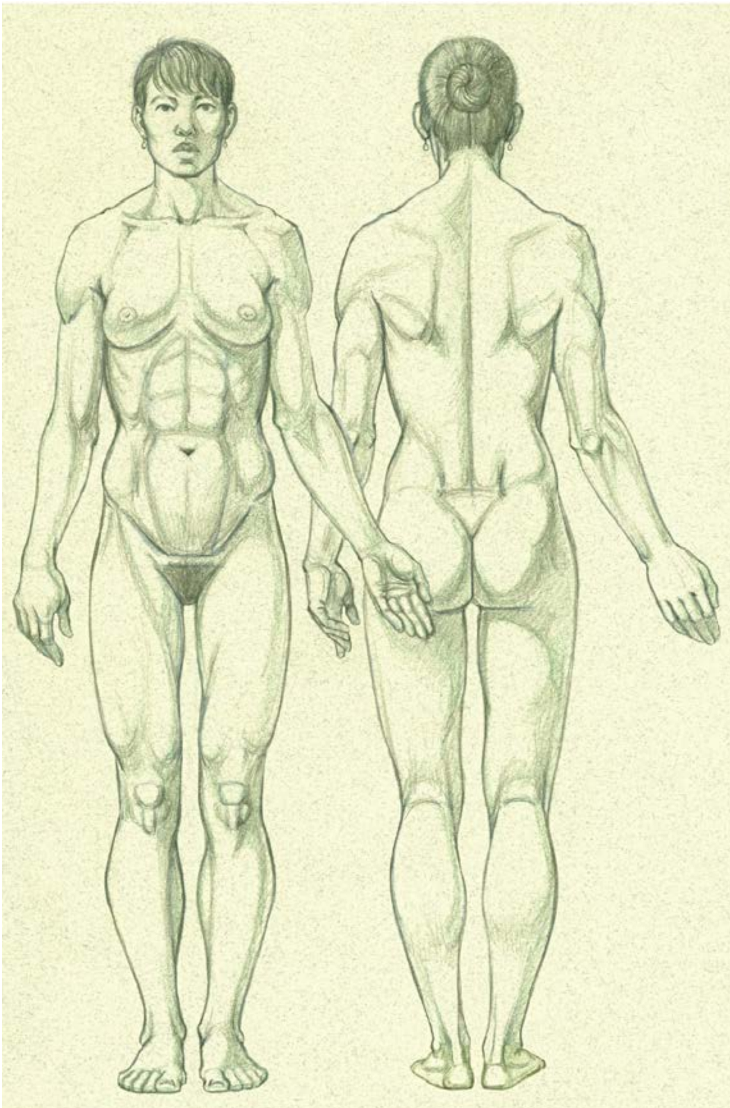
MESOMORPH BODY TYPE

Male figure



Anterior and posterior views

Female figure



Anterior and posterior views

Among bodybuilders you see many variations on the mesomorph body type. A person who is tall and lean but has distinct muscle definition can be classified as a cross

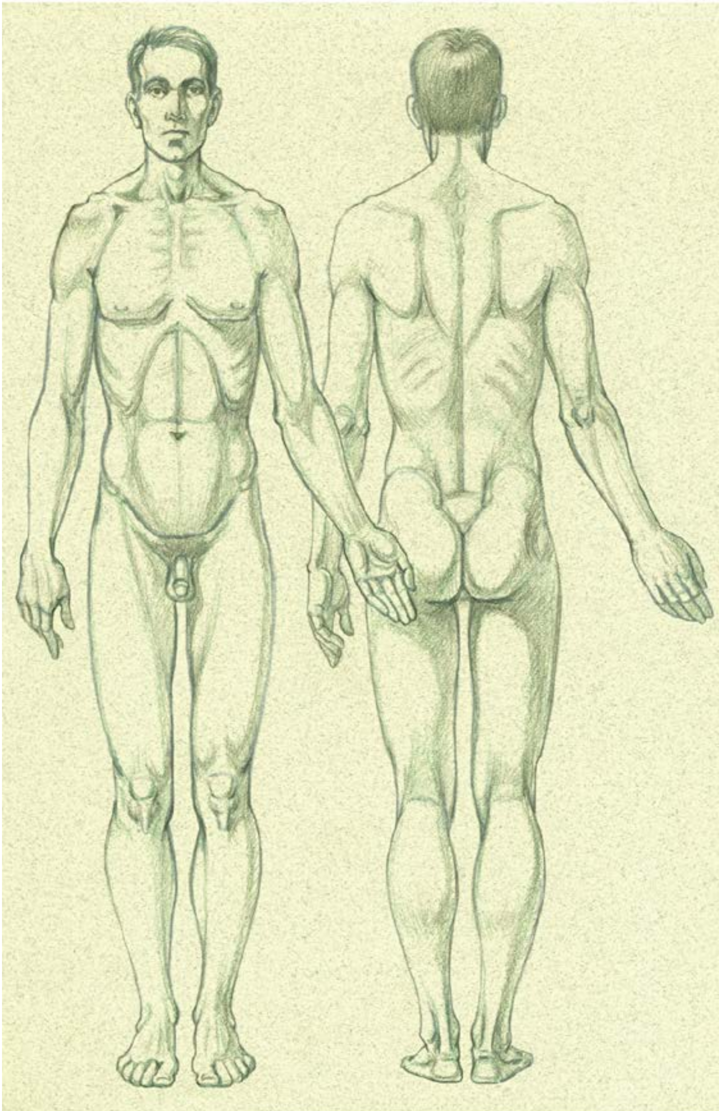
between the mesomorph and ectomorph body types (“ecto-mesomorph”). This type of physique can be described as “Apollonian,” after the typical depiction of the god Apollo in Greco-Roman art. A physique combining mesomorph and endomorph traits (“endo-mesomorph”), with exaggerated muscular definition, might be called “Herculean,” after depictions of the mythic hero Hercules.

The Ectomorph Body Type

The ectomorph is slender and delicate in appearance. An ectomorph’s bones are fairly noticeable on the surface form because of the relative lack of fatty tissue. Some ectomorphs have lean but apparent muscles, while others, who are not muscular, have a somewhat flaccid look. The upper body tends to be short, with a narrow rib cage, pelvis, and shoulders, while the limbs, hands, face, and neck are usually long and thin. There is always some amount of adipose tissue in the subcutaneous layer, even on exceedingly thin people, but if this layer becomes extremely diminished, the ectomorph’s body may look malnourished or anorexic. Basic traits of the ectomorph—male and female—are shown in the following drawings.

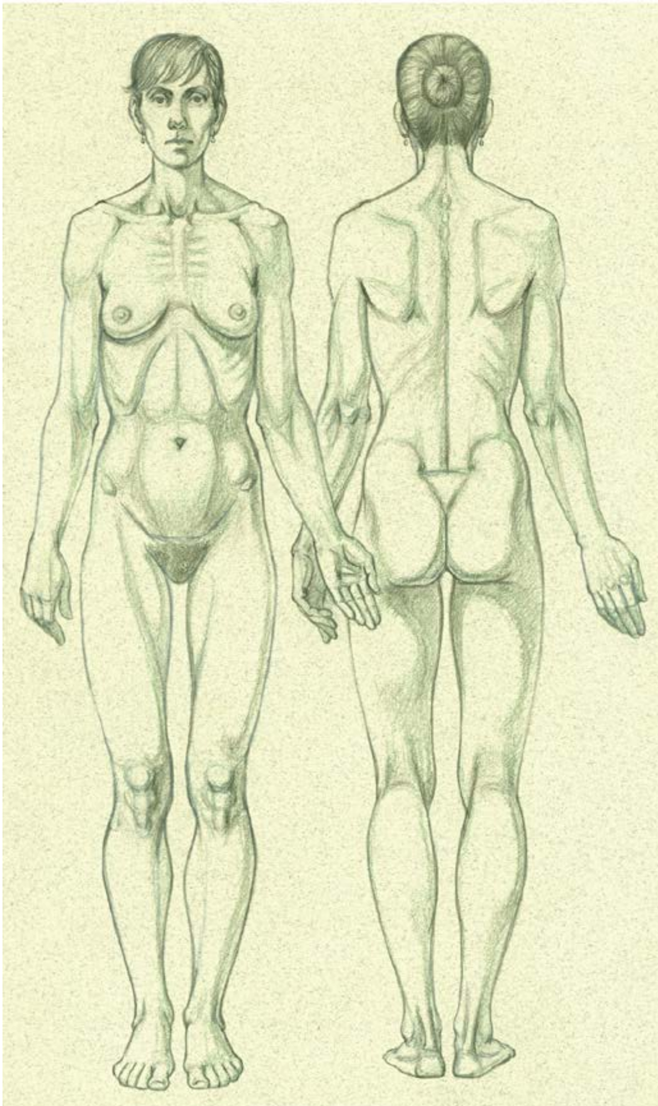
ECTOMORPH BODY TYPE

Male figure



Anterior and posterior views

Female figure



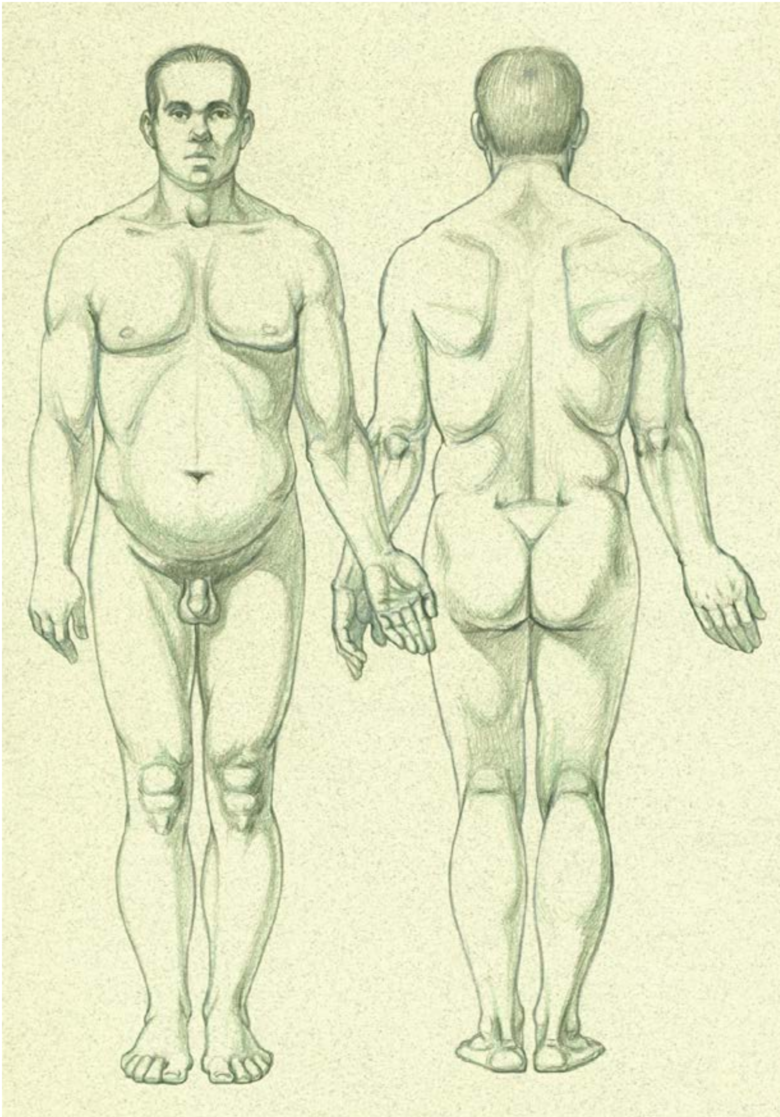
Anterior and posterior views

The Endomorph Body Type

The endomorph body type covers a wide variety of subtypes, from slightly plump, to portly, to obese. The fatty tissue throughout the body is distributed differently from individual to individual, and the physical appearance of the endomorph's torso can range from a large bulbous shape with normal hip size (referred to as an "apple-shaped" body) to a "pear shape" caused by the accumulation of fatty tissue primarily on the abdomen, hips, and buttocks. The limbs in the endomorph type are usually thick, but the wrists and ankles may appear lean since fatty tissue does not normally accumulate in these regions unless the person is severely obese. The face is characteristically round with a short, bulky neck. Hands and fingers will appear thick and slightly pudgy, while the feet tend to broaden due to the excess weight bearing down on the supporting arches of the feet. Basic traits of the endomorph—male and female—are shown in the following drawings.

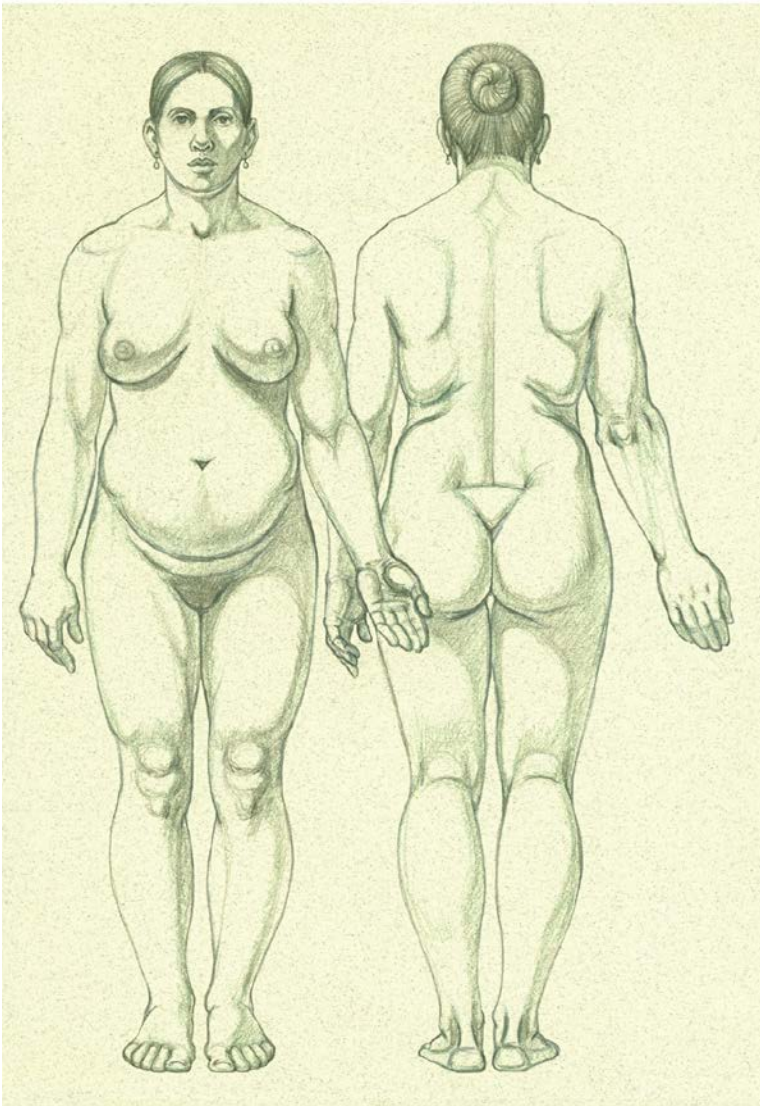
ENDOMORPH BODY TYPE

Male figure



Anterior and posterior views

Female figure



Anterior and posterior views

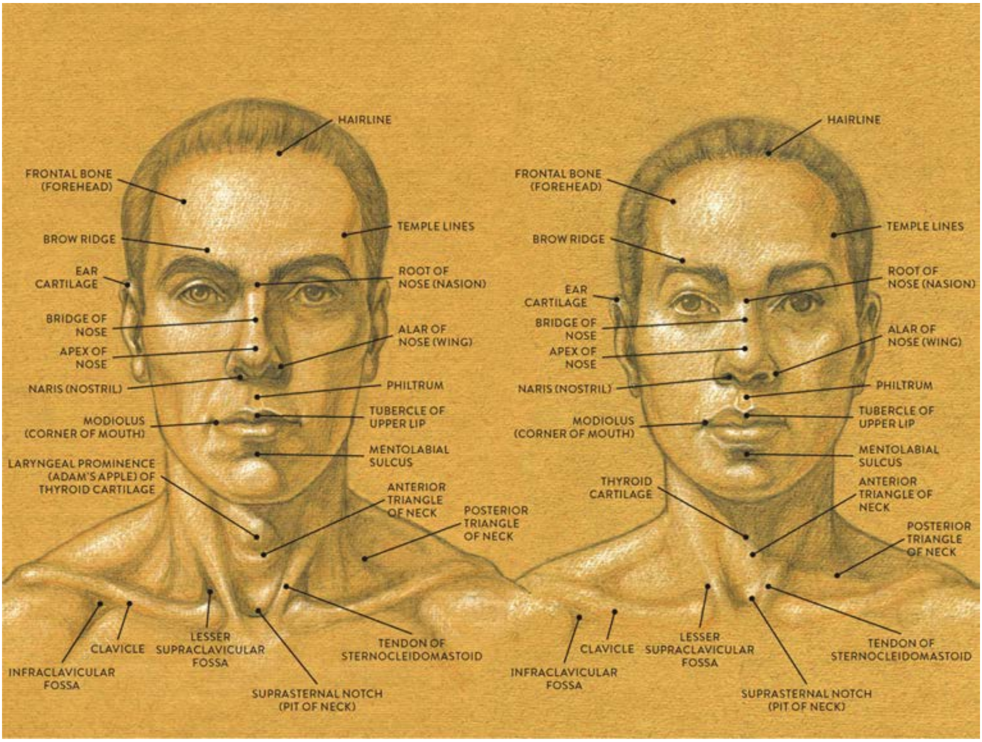
Surface Form Landmarks

We will now take a closer look at the various *landmarks* seen on the body surface, including key bony landmarks that make important contributions to the surface form. Fatty tissue's extensive influence on surface form will be examined in more detail in the following sections.

Landmarks of the Head and Neck

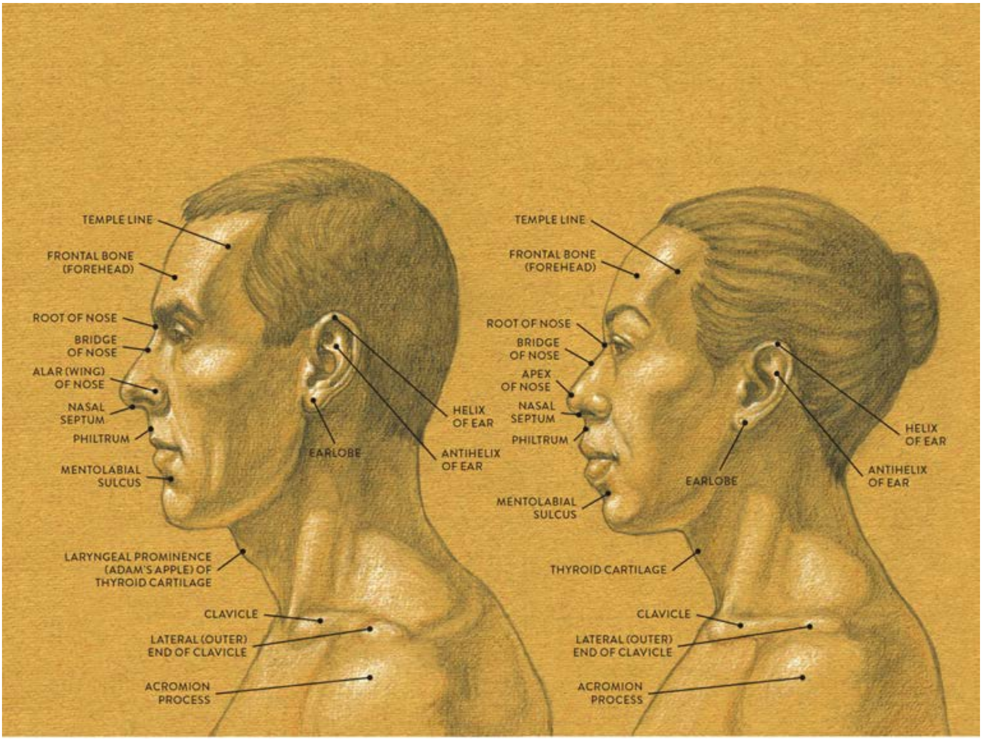
We begin this section with front and side views of the male and female head, opposite and below, which identify the basic surface form landmarks, including key bony landmarks. When depicting a face realistically, always be aware of the general shape of the cranium. Although hair might obscure most of the skull's ostrich-egg shape (see this page), you should always indicate the general width and height of the head as you are setting up the facial forms. And always remember that although the facial bones are covered by muscles and a layer of soft subcutaneous tissue, they importantly serve as the bony scaffolding for the facial muscles. Connective-tissue structures such as the cartilage of the nose and ear and the softer-tissue forms of the lips and eyes are easily seen.

SURFACE FORM LANDMARKS OF THE HEAD AND NECK—MALE AND FEMALE



LEFT: Male head, anterior view

RIGHT: Female head, anterior view



LEFT: Male head, lateral view

RIGHT: Female head, lateral view

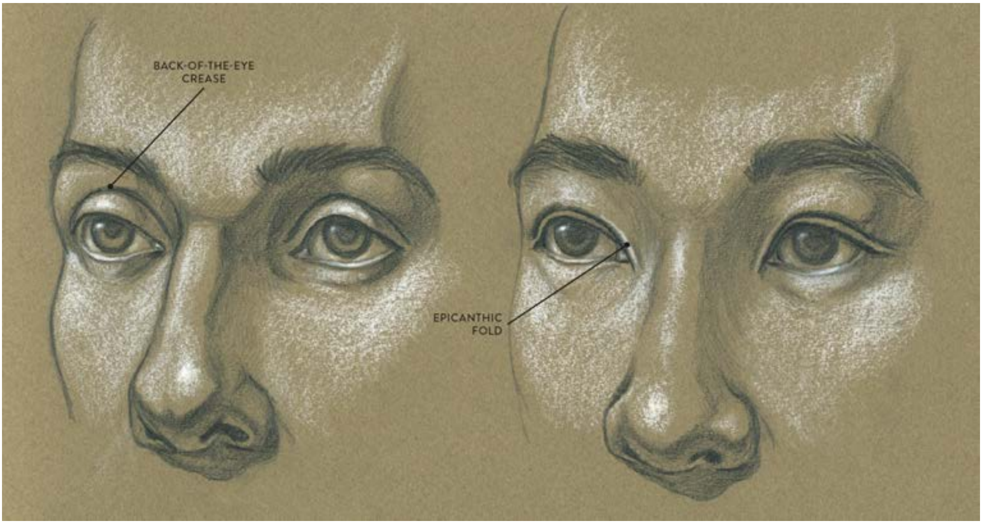
Landmarks of the Eye Region

The spherical shape of the eye is suspended within the orbit (eye socket) by a series of thin muscles and cushioned by *orbital fat.* Attaching on the outer rim of the orbit is a thin membrane-like sheathing called the *orbital septum,* which inserts into the eyelids. Positioned over the orbital septum is the orbicularis oculi muscle.

There are many subtle variations on the way the eyelids wrap over the front portion of the eyeball, depending on whether the fat pads surrounding the eye influence the lids. In some eyes there is a crease above and parallel to the curve of the eye. Identified as the *back-of-the-eye crease,* it can be a subtle crease or a deep fold. As the upper lid closes, the back-of-the-eye crease temporarily disappears, returning when the lid opens. Other eyes have a different type of upper-lid structure, called an *epicanthic fold.* It falls close to the edge of the upper lid and partially covers the inner corner of the eye. As a result,

there is no strong crease at the upper back portion of the eye. Fatty tissue pads soften the region of the upper and lower lids. There are countless variations of these eye folds throughout the world.

TWO TYPES OF EYE FOLDS



LEFT: This fold parallels the upper curve of the eye.

RIGHT: This fold is close to the edge of the upper lid, partly covering the inner corner of the eye.

The inner corner of the eye, called the *medial angle of the eye,* has an extremely small triangular depression containing a pink fleshy structure called the *lacrimal caruncle.* The outer corner of the eye, where the upper and lower lids meet, is called the *lateral angle of the eye.*

The *iris* is the colored disc of the eye. Irises come in various shades of brown, green, blue, and gray, with some eyes containing a mixture of brown and green pigments, producing hazel-colored eyes. At the center of the iris is the *pupil,* an aperture that fluctuates in size (see this page).

Landmarks of the Nose

The nose structure essentially consists of the nasal bone and the nasal cartilages. The immense variation in nose shapes is caused by differing shapes of the nasal bone and cartilages, as well as differing widths of the nasal cavity.

The nose begins between the eyes at what is called the *root of the nose* (*nasion*). The top plane of the nose is referred to as the *dorsum of the nose* or *bridge of the nose.* If the nasal bone is positioned at an acute angle, the bridge of the nose will be more pronounced, possibly with a subtle or prominent bump at the transition between the nasal bone and the cartilage. If the nasal bone is flatter, then the bridge of the nose will be

lower, generally with a smoother transition between the nasal bone and the cartilage.

Along the midline of the nose is the *septal cartilage,* which also acts as a partition within the nasal cavity. The *nasal septum,* a continuation of the septal cartilage, is seen as the soft-tissue structure between the *nostrils* (sing., *naris*; pl., *nares*).

The lower part of the nose is constructed of cartilages and soft-tissue forms. The *lateral nasal cartilage* is attached to each side of the nose; the *greater alar cartilage* creates the general shape of the tip of the nose (*apex of the nose*). The characteristics of this cartilage vary: The tip of the nose can be small, large, spherical, angular, wide, or narrow and can point upward or droop downward.

The *wings of the nose* (*alar of nose*) are composed of fibrous connective tissue and fatty tissue surrounding each nostril. Some noses have a wide nasal cavity, producing a broader nose in which the wings of the nose are farther apart. A smaller nasal cavity produces a narrower nose, with the wings of the nose closer together. Smaller cartilages, called the *lesser alar cartilage,* are situated near or on the wings of the nose but are usually not detected on the surface form.

Between the nasal septum and the upper lip is a vertical, trenchlike depression in the skin called the *philtrum.* Depending on the space between the bottom of the nose and the upper lip, the philtrum can be long or short. Also, the shape of the upper lip can influence the width of the philtrum, making it narrower or wider.

Landmarks of the Mouth Region

The *upper and lower lips* are actually part of the orbicularis oris muscle. Lips can vary in size and shape depending on the relationship between the upper and lower dental arches, the positions of the maxilla and mandible, and the placement of the teeth. The upper and lower lips can be thick, curving, and sensuous or thin, angular, and tense. They can also be wide or narrow, projecting or receding.

At the center of the upper lip a small projection called the *tubercle of the upper lip.* It contains a small amount of fatty tissue that helps create its shape. This tubercle can be quite prominent or very subtle.

At each corner of the mouth is a small mound in the skin called the *modiolus.* Several facial muscles insert here. Fatty tissue gives the modiolus a slight bulge, sometimes creating a small fold in the skin.

Surrounding both the upper lip and lower lip, at the *vermillion border of the lips,* is a thin ridge consisting of fibrous connective tissue called the *lip rim.* It usually catches highlights, making it easier to see against the darker pigment of the lips.

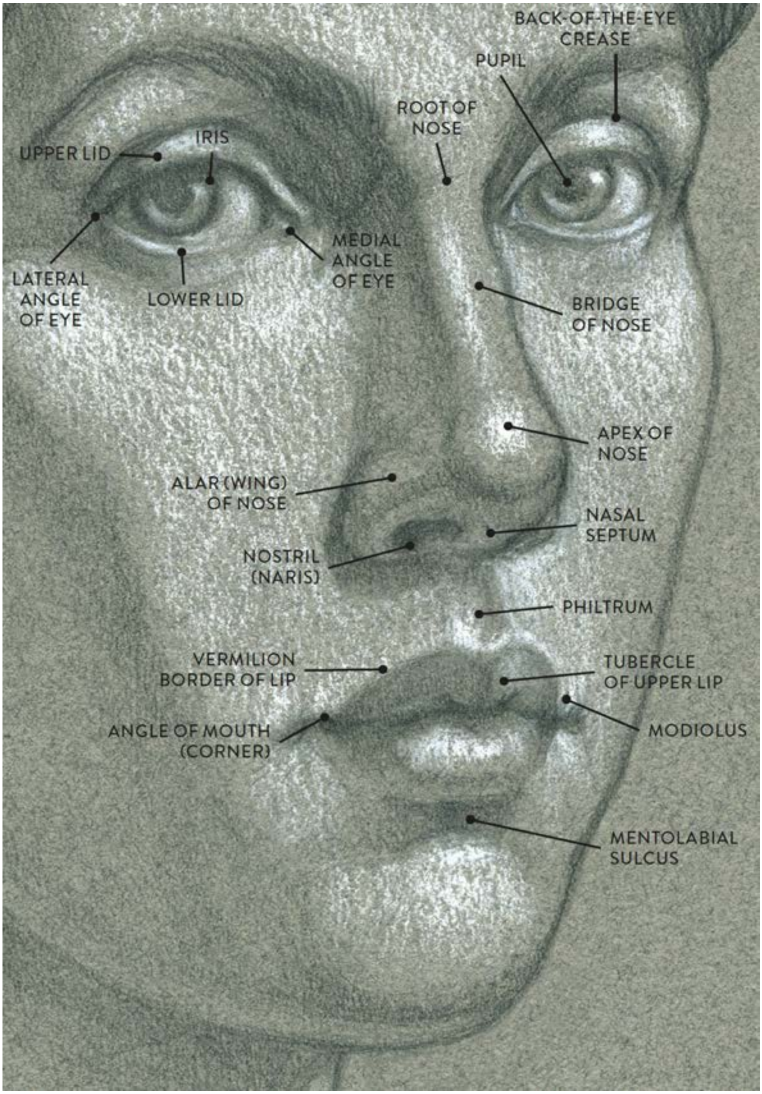
On a relaxed face, the *nasolabial fold* is a soft plane change near the outer wing of the nose and the outer edge of the orbicularis oris muscle. When a person smiles or laughs this furrow lengthens and can become an obvious semicircular fold in the skin (see this

page). As a face ages, this fold transforms into a noticeable permanent crease that descends in a curving alignment from the wing of the nose toward the outer corner of the mouth.

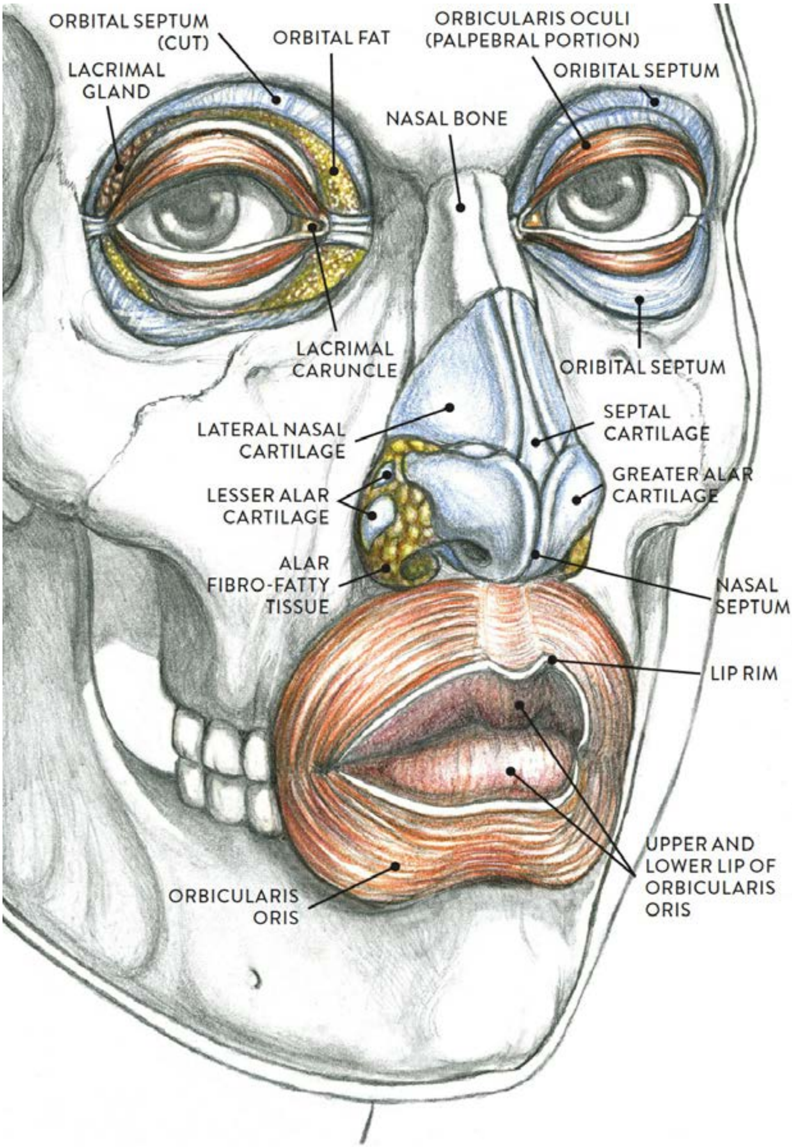
Positioned immediately below the lower lip and above the chin region is a small indentation in the skin called the *mentolabial sulcus,* which simply means “furrow between the lip and chin.” This depression can be obvious, especially if the lower lip is full and prominent, or shallow if the lower lip is rather thin.

The following life study shows many of the landmarks of the eye region, nose, and mouth region; the accompanying anatomical study reveals the structures beneath the skin.

LANDMARKS OF THE EYE REGION, NOSE, AND MOUTH REGION



Life study of face in cropped three-quarter view

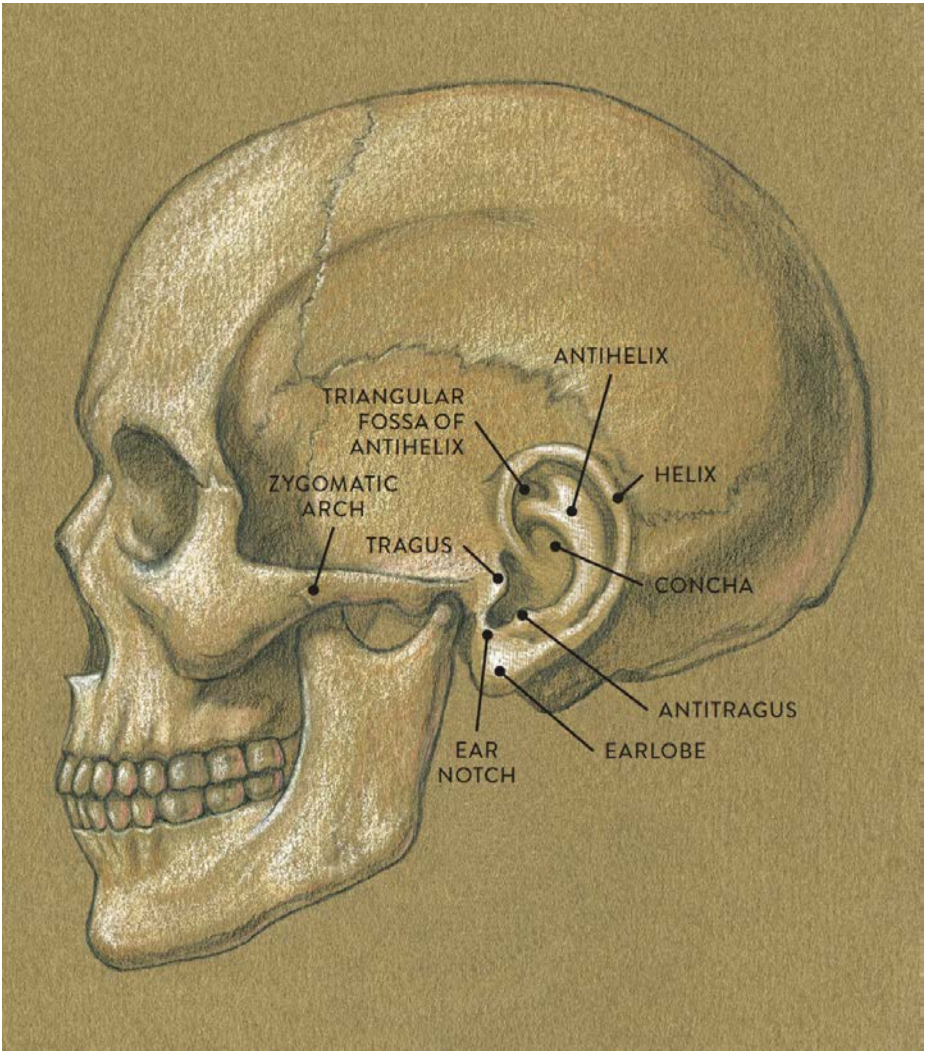


Anatomical study

Landmarks of the Ear

Ears can lie snugly against the head or project outward. They can be small or large, angular or curved. Their tubular forms can be thick or delicate. The ear structure is comprised mainly of cartilage, while the earlobe contains fibrous fatty tissue.

The form of the ear is convoluted, consisting of a bowl-like structure, called the *concha,* and spiraling tubular forms attaching around and within the bowl. The outer tubular rim is called the *helix,* and the inner tubular rim is called the *antihelix.* As the antihelix sweeps toward the ear lobe a small bump called the *antitragus* is seen. In front of the ear canal (*external auditory meatus*) is a small protruding (though somewhat flattened) cartilage form called the *tragus.* Between the tragus and antitragus is the *ear notch.*

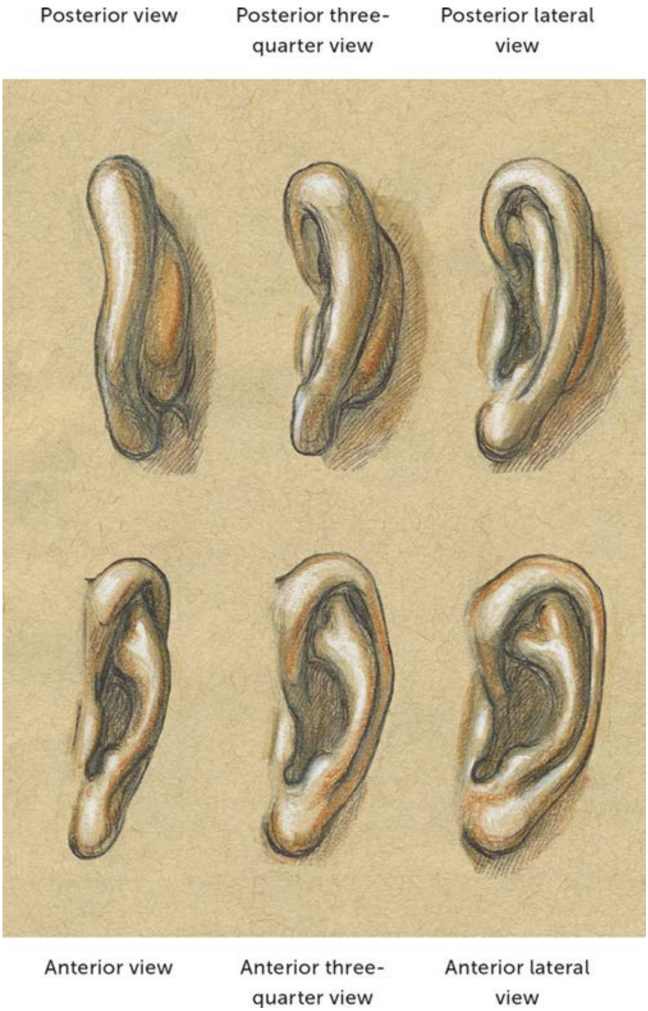


Lateral view

The earlobes are made not of cartilage but of fatty and fibrous tissue. On some ears the lobes can hardly be detected, while in others they have an obvious fleshy shape. Some earlobes can be quite prominent, appearing as large hanging flaps. This can result from the aging process or from the lobe's being stretched by heavy earrings or disc-like plugs (gauges) inserted in the lobe.

The ear is positioned over the ear canal at the end of the zygomatic arch. The drawing at left shows the ear's placement on the cranium (as seen from the side), as well as its various forms. The following study *Views of a Left Ear,* shows how dramatically the ear changes shape when viewed from various perspectives.

VIEWS OF A LEFT EAR



Hair Characteristics

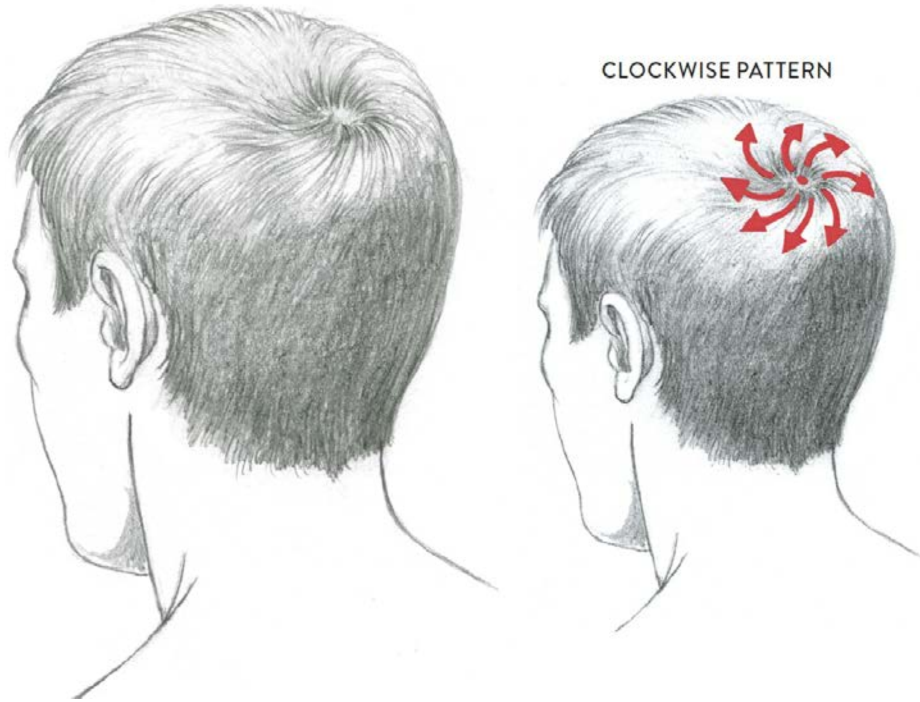
The hair is part of the integumentary (skin) system, because hair follicles (the bulblike forms that produce individual hairs) are located in the epidermis and dermis layers of the skin.

Depicting Hair

The shape, texture, and growth pattern of hair are essential elements for figurative artists to consider. The style of a person's hair can, after all, be part of his or her unique character or identity (think, for example, of Albert Einstein, Princess Diana, Elvis Presley, or Bob Marley).

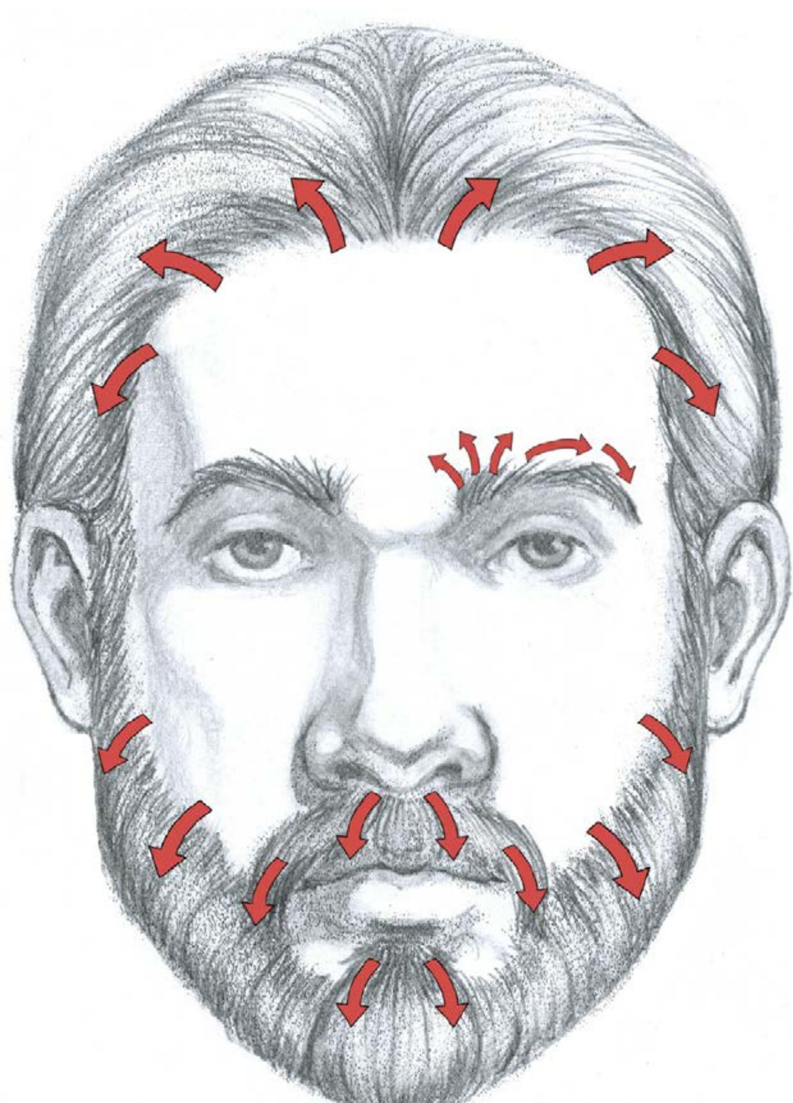
Hair emerging from the scalp creates a border, called the *hairline,* around the upper face, swinging around the ears and the back of the neck (nape). *Hair growth patterns* include the *hair whorl,* located toward the upper back portion (the *crown*) of the head. The hair whorl, shown in the following drawing, usually appears as a vortex of hair growing in a swirling, circular motion, either clockwise or counterclockwise. Some people have a reversed tuft of hair emerging upward from the center of the hair whorl, commonly called a cowlick.

STUDY OF A HAIR WHORL



As with the hair of the head, the growth patterns of facial hair—eyebrows, sideburns, mustaches, beards—are directional, as shown in the next drawing. Indicating this directionality is essential to an accurate depiction.

DIRECTIONAL GROWTH PATTERNS FOR HAIR, EYEBROWS, AND BEARDS



Most hair stylists agree that there are four basic hair types: wavy, curly, very curly, and straight. These four types are shown in the drawing on this page. *Wavy hair* has a gentle spiraling movement throughout its length. *Curly hair* can be somewhat tight (in ringlets) or more relaxed. When depicting curly hair, look for *curl clusters*—sections of hair that move in different spiraling patterns. *Very curly hair* grows in a tight spiraling

formation. It can be braided close to the cranium, or strands of hair can be twisted together, appearing as small springy locks that gently flare outward from the head. It can also be allowed to grow naturally into elongated cylindrical coils, called *locks* (or *locs*). *Straight hair* can be any length, trimmed straight across or layered. Short straight hair can be spiky, flaring out from the skull; as straight hair grows longer, gravity pulls the strands downward.

BASIC HAIR TYPES

Wavy hair

Very curly hair

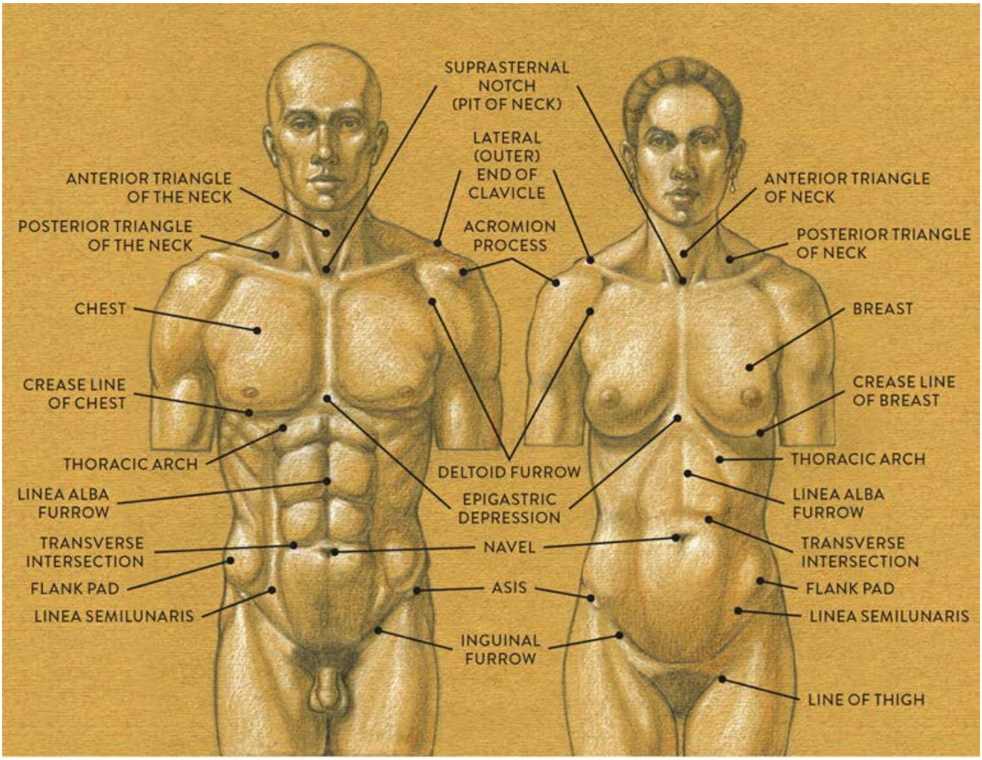
Curly hair

Straight hair

Landmarks of the Torso

Let’s begin our survey of the surface landmarks of the torso with the three drawings that follow, which show the landmarks of the anterior and posterior portions of the male and female torso as well as those landmarks visible from a lateral (side) view. These are followed by discussions of the anterior and posterior landmarks, respectively.

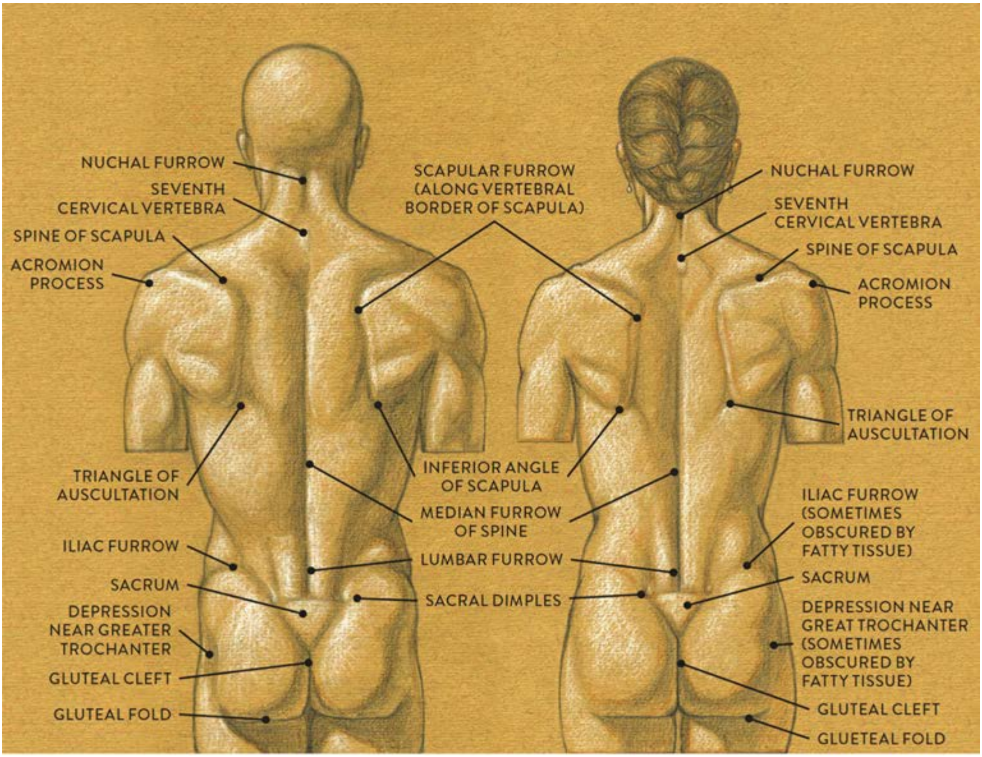
SURFACE FORM LANDMARKS OF THE TORSO—MALE AND FEMALE



LEFT: Male torso, anterior view

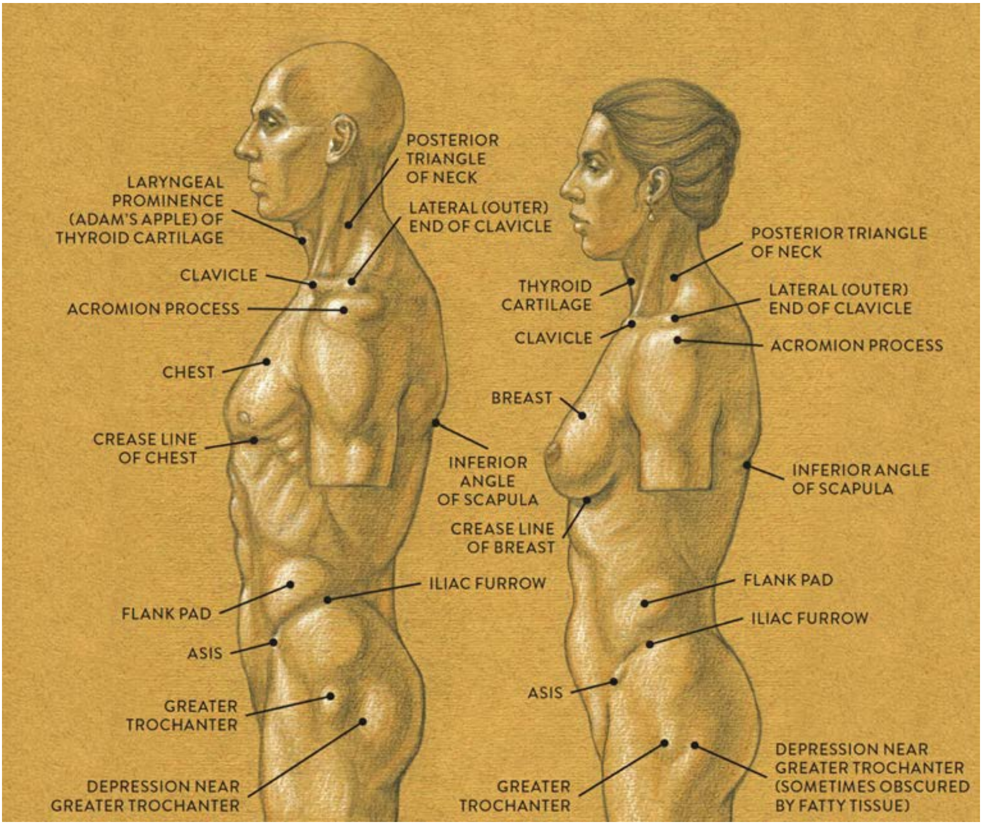
RIGHT: Female torso, anterior view

SURFACE FORM LANDMARKS OF THE TORSO—MALE AND FEMALE



LEFT: Male torso, posterior view

RIGHT: Female torso, posterior view



LEFT: Male torso, lateral view

RIGHT: Female torso, lateral view

Landmarks of the Anterior Region of the Torso

The *crease line of the chest* (or *crease line of the breast*) is the natural base of the chest/breast region. The skin located at the base of the chest/breast is anchored or fused to the deep fascia to help contain the soft-tissue forms of the chest. On smaller chests/breasts, this lower border is more like a subtle crease or furrow; on fuller breasts the lower border is a deeper fold.

On the front of the torso near the base of the sternum (xiphoid process) is a small triangular depression called the *epigastric depression.* From the xiphoid process a fibrous band of connective tissue called the *linea alba* continues in a vertical alignment

down the abdomen to attach into the pubic bone. It creates a vertical furrow (*linea alba furrow*) on the surface from the base of the sternum to the navel and sometimes below the navel.

Located between the outer edge of the rectus abdominis muscle and the inner edge of the external oblique muscle is a furrow called the *linea semilunaris*. It widens near the ASIS of the pelvis and the inguinal ligament. The horizontal furrows of the abdomen, known as *transverse intersections,* are fibrous bands that interrupt the muscle fibers of the rectus abdominis muscle. When the figure dramatically bends forward from the waist, rolls occur along these transverse intersections.

The *navel* is located in the linea alba. The placement of the navel is usually at the lowest intersection of the transverse lines of the rectus abdominis, slightly below the waist. The subcutaneous fat in this area tends to make the navel appear like a deep depression in the skin. However, some navels are small elevations, similar in shape to a small button, hence the colloquial term "belly button." Depending on the action of the torso (stretching, compression, bending sideways, or twisting), the navel will slightly change shape. It may stretch vertically or horizontally or appear round and craterlike, but it will always remain on the linea alba.

The *inguinal ligament* attaches from each ASIS (the bony bump at each anterior protrusion of the iliac crest of the pelvis) into the pubic bone. It creates a subtle crease, called the *inguinal furrow,* on the surface of the skin. It can appear as a soft curve sweeping from one ASIS toward the other ASIS, with the lower part of the curve anchoring on the pubic bone, or it can be more angular, especially on leaner or more muscularly defined torsos. The inguinal furrow is actually a *flexor crease* linking the skin to the deep fascia and helping keep the soft-tissue forms in place.

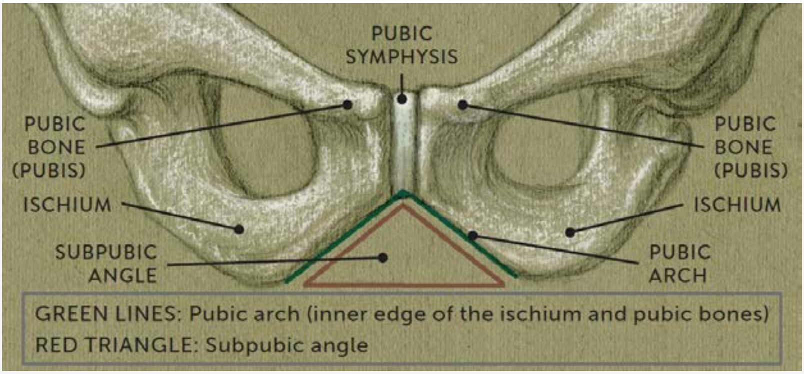
Depicting the Genitalia

From an artistic perspective, the genitals are merely forms of the nude body. Artists who draw, paint, and sculpt the nude need to be aware of the basic shapes of the genitalia and know how to place them correctly on the body.

The outer portions of the genitalia of both sexes are located in the *subpubic angle* (the space within the pubic arch of the pelvis bone), shown in the drawing at right. If the genitalia are placed too high on the figure, they might appear to be positioned on bone, which, anatomically, they are not.

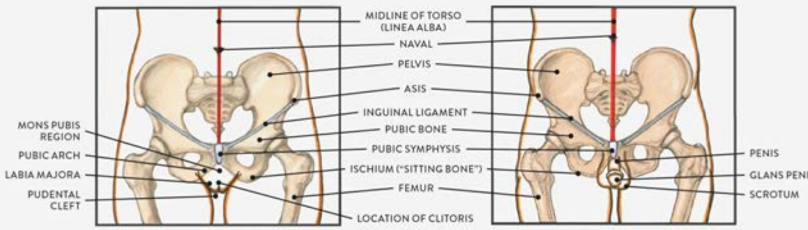
The placement of the genitals is shown in the life studies and accompanying diagrams opposite. On women, a large fat pad (*pubic fat pad*) positioned below the inguinal ligament and over the pubic symphysis produces a soft triangular fleshy mound called the *mons pubis,* also known as the *mount of Venus.* A cleft, called the *pudental cleft,* occurs on the skin starting near the base of the mons pubis. Beneath the upper part of the pudental cleft is the *clitoris,* a small erectile organ. On either side of the pudental cleft are two skin folds containing adipose tissue. These folds are called the *labia majora* and are usually covered with hair.

THE PUBIC ARCH AND SUBPUBIC ANGLE

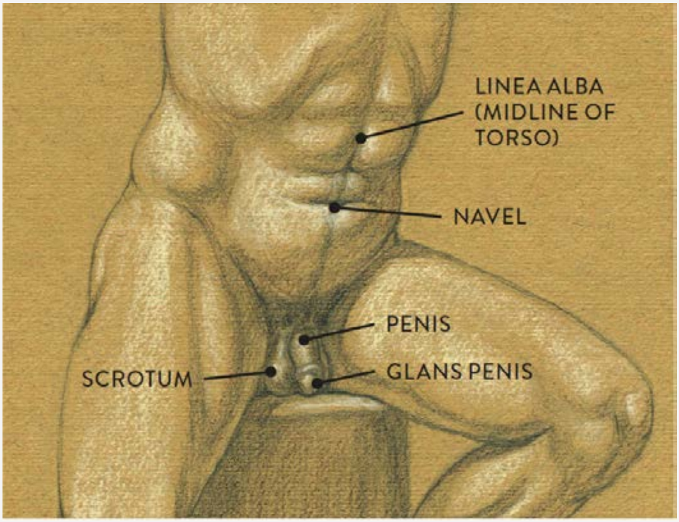


On men, there are two simple shapes to locate—the tubular shape of the penis and the pouch-like shape of the scrotum, containing the two testes (testicles). The length and width of the penis vary among individuals. In uncircumcised men, loose skin covers the entire length of the penis, overlapping the tip, called the *glans penis*. When the penis has been circumcised, the glans penis is exposed. The glans is very smooth and similar in shape to an acorn or the cap of a mushroom. The location where the penis emerges, below the inguinal ligament and pubic symphysis, should align with the midline of the torso. From there, the penis might lean in any direction (left or right, upward or downward) according to the placement of the upper legs and the scrotum in a given pose.

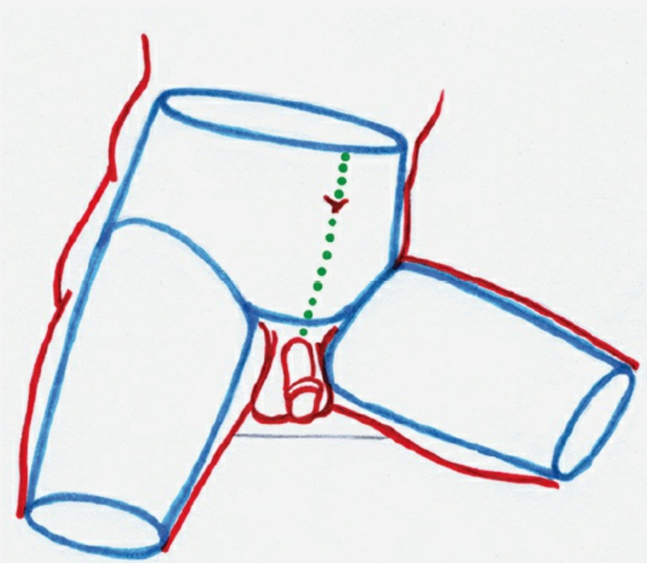
SOFT-TISSUE FORMS OF THE GENITALIA IN RELATION TO THE PELVIS



Torso Study of a Male Figure



Graphite pencil, colored pencil, and white chalk on toned paper



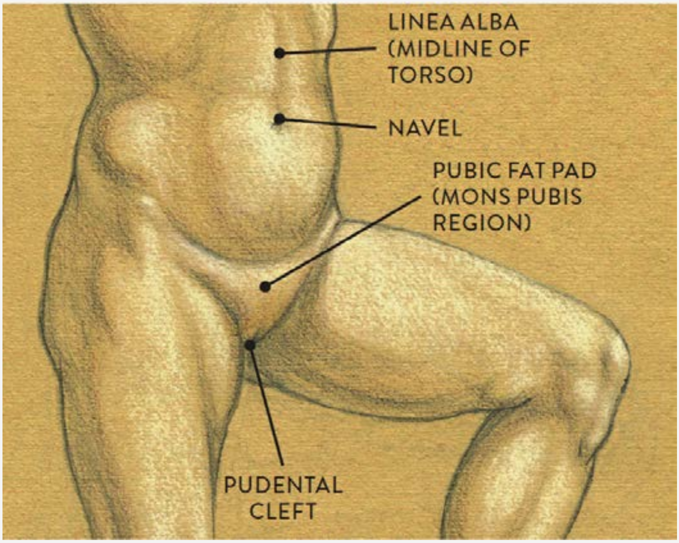
Placement diagram

BLUE LINES: Structure

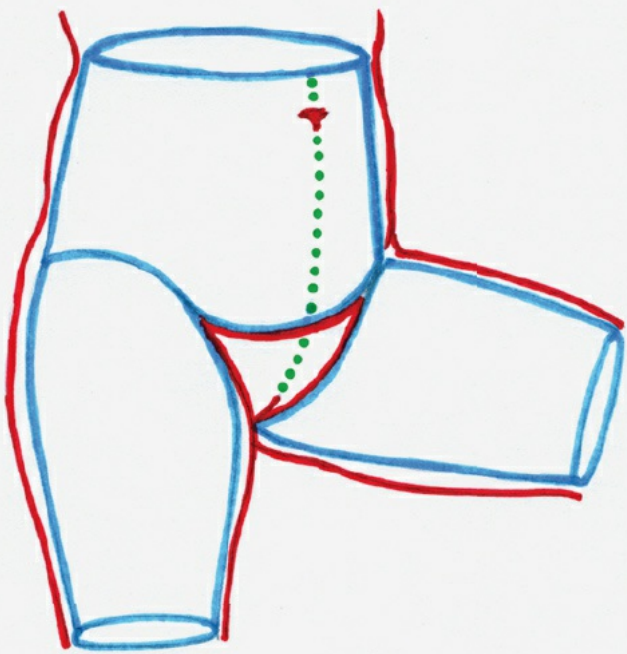
RED LINES: Soft-tissue forms

DOTTED GREEN LINE: Midline of torso

Torso Study of a Female Figure



Graphite pencil, colored pencil, and white chalk on toned paper



Placement diagram

BLUE LINES: Structure

RED LINES: Soft-tissue forms

DOTTED GREEN LINE: Midline of torso

The shape of the scrotum can vary, looking like a peach in cooler temperatures or when the thighs are positioned close together in sitting poses. In standing poses, when the scrotum is influenced by gravity (or when the temperature is warmer), it becomes slightly elongated and has the shape of a pear or avocado.

Landmarks of the Posterior Region of the Torso

The *nuchal furrow* is a subtle vertical furrow that is sometimes seen on the back of the neck. This is the location of the *nuchal ligament,* which is a flat, triangular ligament that attaches at the back of the skull and along the spinous processes of the cervical vertebrae of the neck. Fibers of the trapezius muscle flank both sides of the nuchal ligament, causing the furrow, which tends to be more apparent on leaner or more muscular figures.

An elongated furrow called the *scapular furrow* can at times be detected on the surface at the inner (vertebral/medial) border of the scapula. This furrow helps identify where the scapula is positioned on the rib cage.

A very small triangular depression called the *triangle of auscultation* can occur at the vertebral border of the scapula near the bottom tip (inferior angle of the scapula); it is also surrounded by the outer border of the trapezius muscle and the upper border of the latissimus dorsi muscle. Its base, or “floor,” is a portion of the rhomboid major muscle. Auscultation means “listening,” and the depression came by its name because it is where a doctor places a stethoscope to listen to a patient’s lungs. This small surface landmark can help artists identify the position of the lower end of the scapula. Although in some poses a small depression occurs in this region, in other poses a small triangular budge will appear, which is actually a portion of the rhomboid muscle contracting.

Along the vertebral column a deep, trenchlike furrow may occur, especially in dynamic poses when the vertebral column is bending back (extension) or the arms and shoulders are pushing back. These actions cause the sacrospinalis and trapezius muscles to contract into thick cylindrical forms. In the thorax region, this furrow is called the *median furrow of the spine,* but it is referred to as the *lumbar furrow* when it appears in the lumbar region. The sacrospinalis muscle is smaller in the lumbar region and produces two small cylindrical forms immediately above the sacrum bone when there is tension in the back. Small furrows on the outer edges of these columnlike forms can occasionally be detected on the surface.

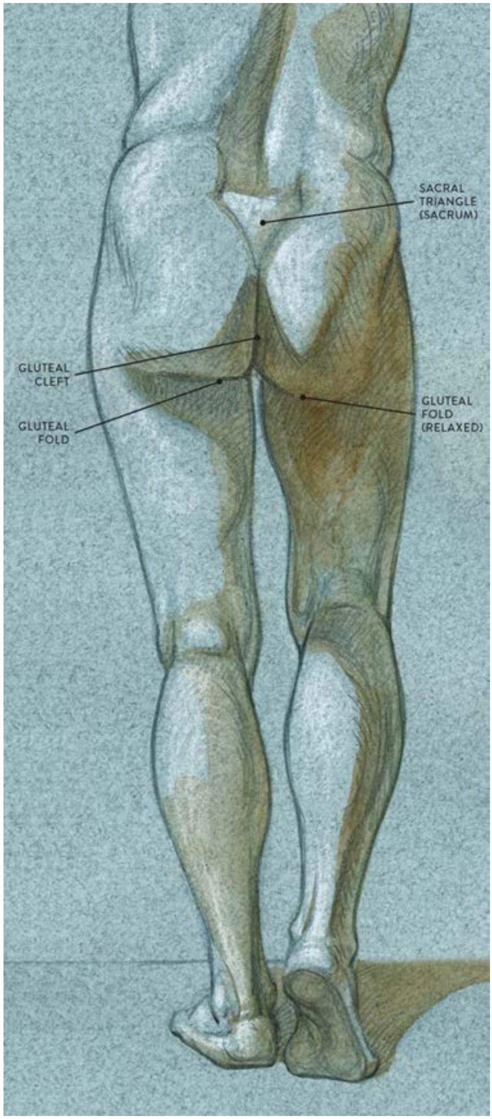
On posterior and side views of the torso, a furrow called the *iliac furrow* is sometimes seen in the skin between the muscular forms of the external oblique (flank pad) and the iliac crest. The *flank pad* is sometimes enhanced with a layer of fatty tissue, which can give it a rather prominent round shape on the surface form.

The sacrum bone is padded with a thin layer of connective tissue, producing a soft,

sometimes slightly bulging triangular shape, called the *sacral triangle,* on the surface. The top border of the sacral triangle runs from one PSIS (posterior superior iliac spine) to the other. The *sacral dimples* are two small indentations, located near the PSIS landmarks, that are produced by the underlying fascia's attachments to the ends of the iliac crest. Even though these dimples are quite small, they are important surface landmarks because they indicate the top border of the sacrum.

The gluteus maximus muscles attach along the outer edge of the sacrum, one on either side. As they move away from the lower point of the sacrum in opposite directions, they create a deep vertical crevice called the *gluteal cleft.* The *gluteal fold* is a horizontal skin crease bordering the lower region of the gluteus maximus. It is created by a straplike fibrous tissue band called the *buttock suspensory ligament,* which contains fatty tissue. When the leg is standing vertically, the gluteal fold is indicated as a strong horizontal crease sweeping away from the gluteal cleft; when the leg bends, this crease relaxes and temporarily disappears on the surface form, as shown in the following life study.

LIFE STUDY SHOWING GLUTEAL CLEFT AND GLUTEAL FOLD

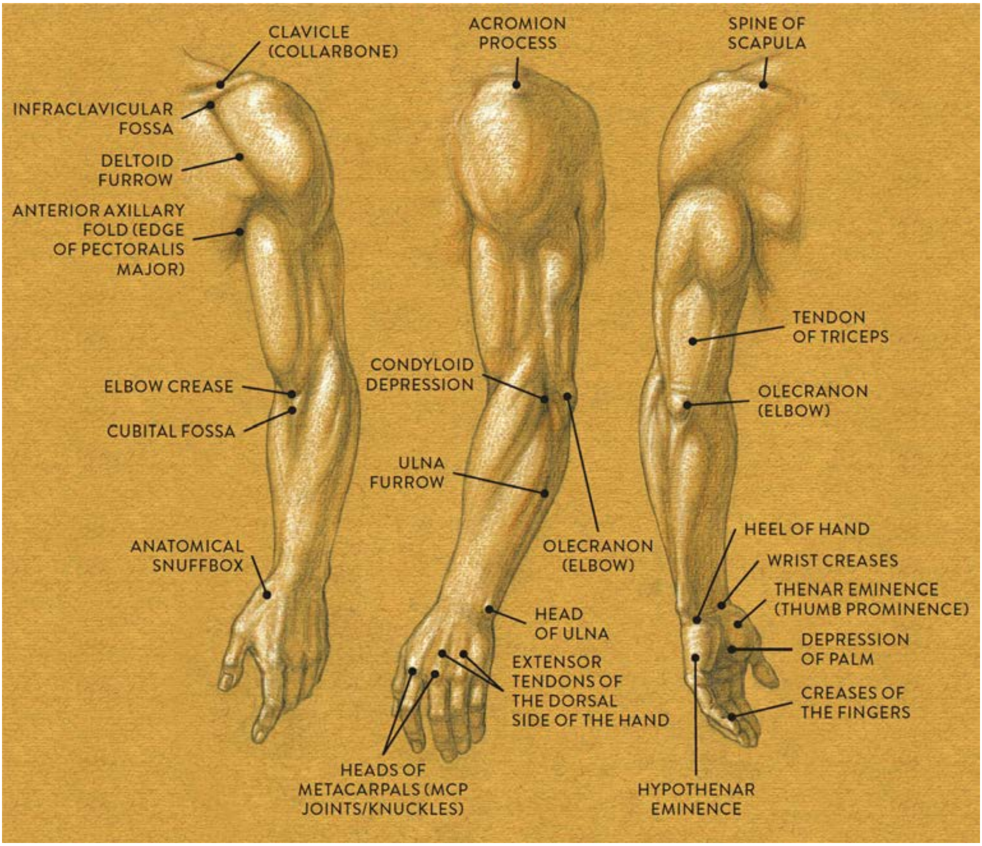


Ballpoint pen, watercolor wash, and white chalk on toned paper.

Landmarks of the Arm and Hand

The next drawing gives a visual overview of the surface landmarks of the upper limb—

the upper and lower arm and the hand. Each portion of the upper limb is discussed separately in the sections that follow.



Left arm

LEFT: Anterior view

CENTER: Lateral view

RIGHT: Posterior view

Landmarks of the Upper Arm

The main muscles of the upper arm are easy to detect on a muscularly defined arm: the biceps brachii in front views, the triceps brachii in back views, and the deltoid, which is visible in most views (front, side, and back). Skin furrows may run along the outer borders of these muscles. Between the deltoid and the pectoralis major is a skin furrow called the *deltoid furrow*; this also marks the transition of planes between these two

muscles.

The *anterior axillary fold* is the outer border of the pectoralis major muscle of the chest as it inserts into the upper arm (humerus). It is seen quite clearly when the arm is pulled away (abducted) horizontally from the torso. The thick outer portion of the pectoralis creates the front (anterior) wall of the armpit (axilla).

Landmarks of the Elbow Region

Several small surface landmarks are located in the elbow region. On the anterior (front) side is the *elbow crease,* which is considered a *flexor crease* because it is located at the joint of the elbow where a tremendous amount of bending (flexion) movement occurs. Immediately below this crease is a triangular depression within the skin called the *cubital fossa.* Its shape is created by the borders of the pronator teres and the brachioradialis muscles. As the skin pulls over this region, it dips slightly, causing the triangular depression, which can only be detected on a straight arm. As the lower arm bends against the upper arm, the elbow crease deepens to an obvious fold and the cubital fossa is no longer visible.

Near the lateral (outer) epicondyle of the humerus is a small depression or dimple called the *condyloid depression,* which can be seen when the lower arm is straight or extended. This indentation is between the extensor carpi radialis longus muscle (part of the radial muscle group) and the anconeus muscle near the elbow (olecranon). On a muscularly defined arm, this depression appears as an inverted V-shaped furrow. When the lower arm bends, the dimple disappears and the bony protrusion of the lateral epicondyle of the humerus appears on the surface.

On the posterior portion of the elbow region is the obvious bony landmark of the elbow (olecranon), a small round bony protrusion occurring on the upper part of the ulna bone. It is most noticeable when the lower arm bends. On the straight arm, the elbow is harder to detect on the surface, but minor skin creases above it indicate its whereabouts. On a muscular arm, the triceps tendon might be seen on the surface as it anchors into the olecranon.

Landmarks of the Lower Arm

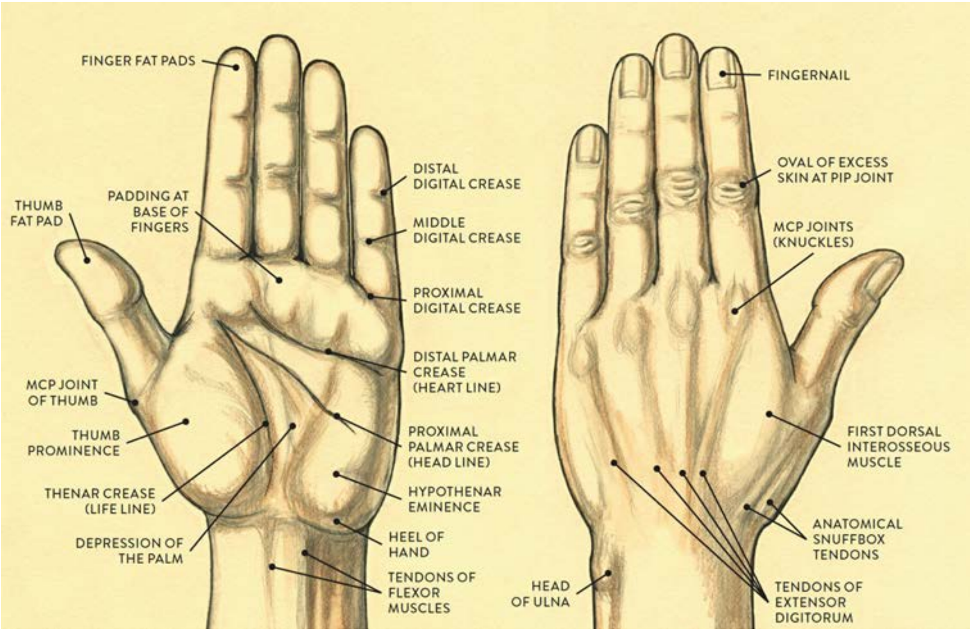
An elongated skin furrow called the *ulnar furrow* can usually be detected in the lower arm. It follows along the ulna bone on the posterior border of the ulna, from the elbow (olecranon) to the outer wrist (head of ulna). This furrow occurs between the flexor carpi ulnaris muscle and the extensor carpi ulnaris muscle of the lower arm.

Wrist creases are subtle horizontal creases across the wrist that are usually more noticeable when the hand bends forward (flexion). Creases may occur on the dorsal side

of the hand at the wrist when the hand is extending back. When depicting wrist creases on a hand that is not bending, draw them extremely lightly so that they do not appear as heavy lines cutting across the base of the palm.

Landmarks of the Hand

There are many obvious surface forms on the hand, especially in the palm region, as shown in the following drawing.



Left hand

LEFT: Palmar surface

RIGHT: Dorsal surface

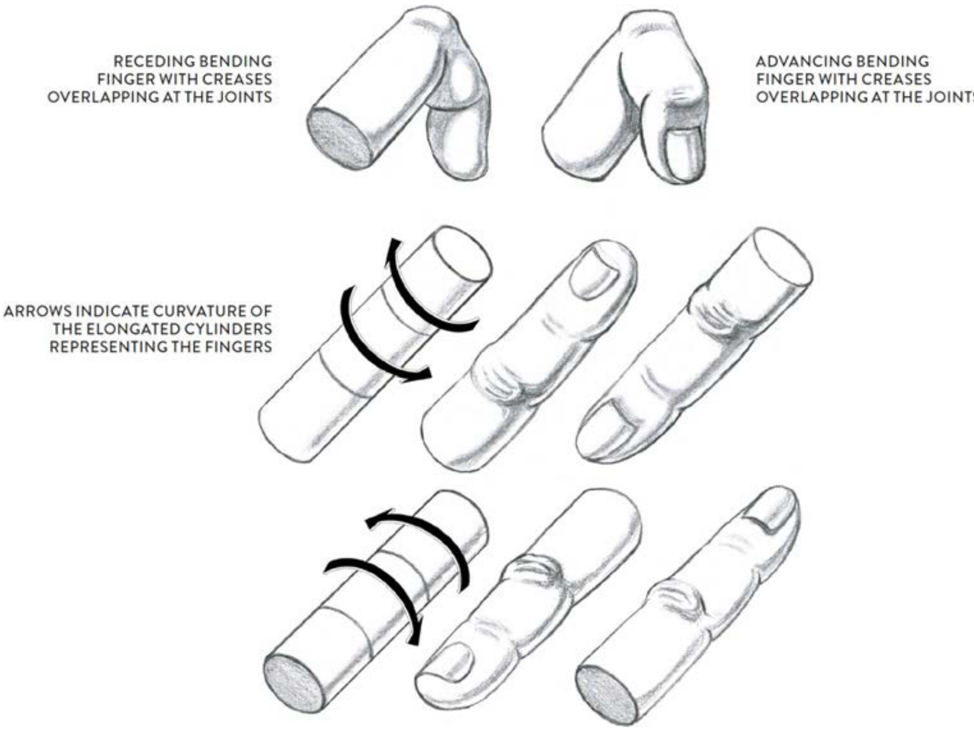
The bottom portion of the *hypothenar eminence* contains the *heel of the hand,* which is the location of the pisaform carpal bone covered over with fibrous fatty tissue. At the base of the fingers on the palm side is an elongated fibrous padding. It tends to divide into rich fleshy mounds when the fingers move as a group or individually. In the central portion of the palm, between the thumb prominence, hypothenar eminence, and the padding at the base of the fingers is a large triangular depression. Known as the *depression of the palm,* it is the location of the *palmar aponeurosis.* The depression is more noticeable when the hand is cupped.

Permanent skin creases on the palm side of the hand are known collectively as *flexor creases of the palm.* While there are several creases in the region of the palm, three especially stand out: the *thenar crease,* the *proximal palmar crease,* and the *distal palmar crease.* The common names for these creases—*life line, head line,* and *heart line,* respectively—derive from the ancient art of palmistry. The thenar crease curves around the thumb prominence. The proximal palmar crease begins near the upper part of

the thenar crease and descends diagonally across the palm. The distal palmar crease travels somewhat horizontally across the palm along the padding at the base of the fingers heading upward toward the second and third fingers.

Skin creases that occur at the joints of the fingers on the palmar side of the hand are known collectively as *creases of the fingers (palm side).* The *distal digital crease* is at the first joint of the finger; the *middle digital crease* at the middle joint; and the *proximal digital crease* at the base of the finger. As the fingers bend these creases deepen into prominent folds and are important to indicate, especially in foreshortened views of the fingers (advancing and receding positions). Even when the foreshortened fingers are straight, the crease lines help to describe how the finger joints are divided into different sections.

FINGER CREASES ON THE CYLINDRICAL SURFACE FORM



Creases follow the curvature of the finger, whether it is advancing or receding.

On the dorsal side of the hand the skin pulls tightly against the surface. Bony landmarks include the knuckles of the hand (MCP joints) and the PIP and DIP joints of the fingers, but are only seen when the fingers are bending. The subcutaneous layer contains minimal fat on the dorsal side of the hand, and the only muscle seen on the surface is the first dorsal interosseous muscle, which appears as a triangular mass between the outstretched thumb and the hand block or as a small egg-shaped form when the thumb is held close to the hand. When the thumb is pulled upward, as in a "thumbs-up" gesture, an elongated triangular depression occurs in the skin near the inner wrist. Called the *anatomical snuffbox,* it is formed by the tendons of the extrinsic muscles of the thumb. (See this page for more discussion of this landmark.)

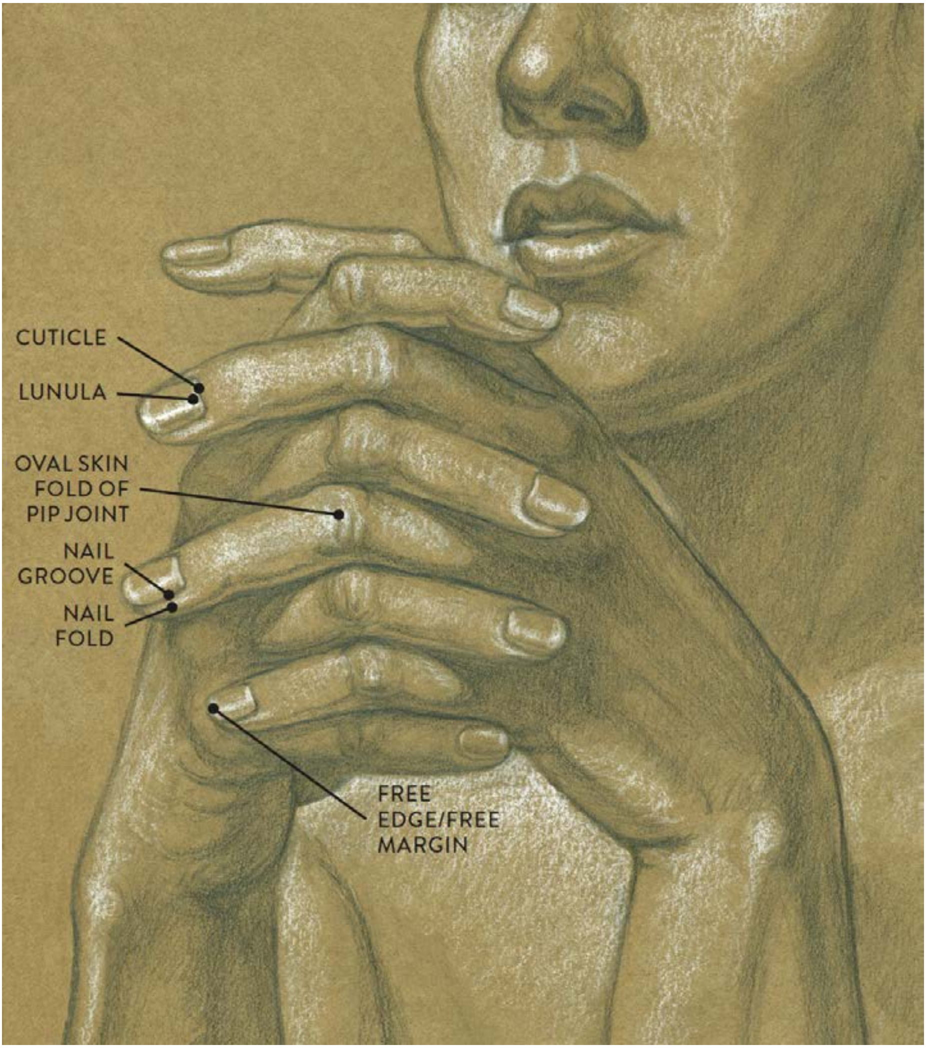
Other surface landmarks of the dorsal side of the hand include the *tendons of the extensor digitorum muscle,* which are more noticeable when the fingers are under tension (as when the fingers are spread apart). Veins are also noticeable, especially on the hands of older people, but most artists edit these out in briefer studies of the hands. In longer studies, tendons and veins can be indicated, though not too strongly if the hand is

youthful. When depicting the hands of an elderly person in a long study, the tendons, veins, and skin creases may be emphasized to help create a sense of character.

Of the skin creases on the dorsal side of the fingers, the most obvious cluster occurs at the PIP joint. The creases appear within an oval skin mass, which is excess skin that stretches out when the finger bends to allow full flexion of the finger.

Fingernails appear shiny and hard because they are made of a material called keratin. Nails can be wedge shaped, fan shaped, square, or oval. At the base of the fingernail is a pale crescent shape called the *lunula.* The tip of the nail is the *free edge,* or *free margin,* which is usually a lighter color than the rest of the nail. The *nail folds* are located on the inner and outer side of the nail, and the border between the nail and nail fold is called the *nail groove.* At the base of the fingernail is the *cuticle.* The life study here shows all these characteristics.

STUDY OF HANDS WITH INTERTWINING FINGERS

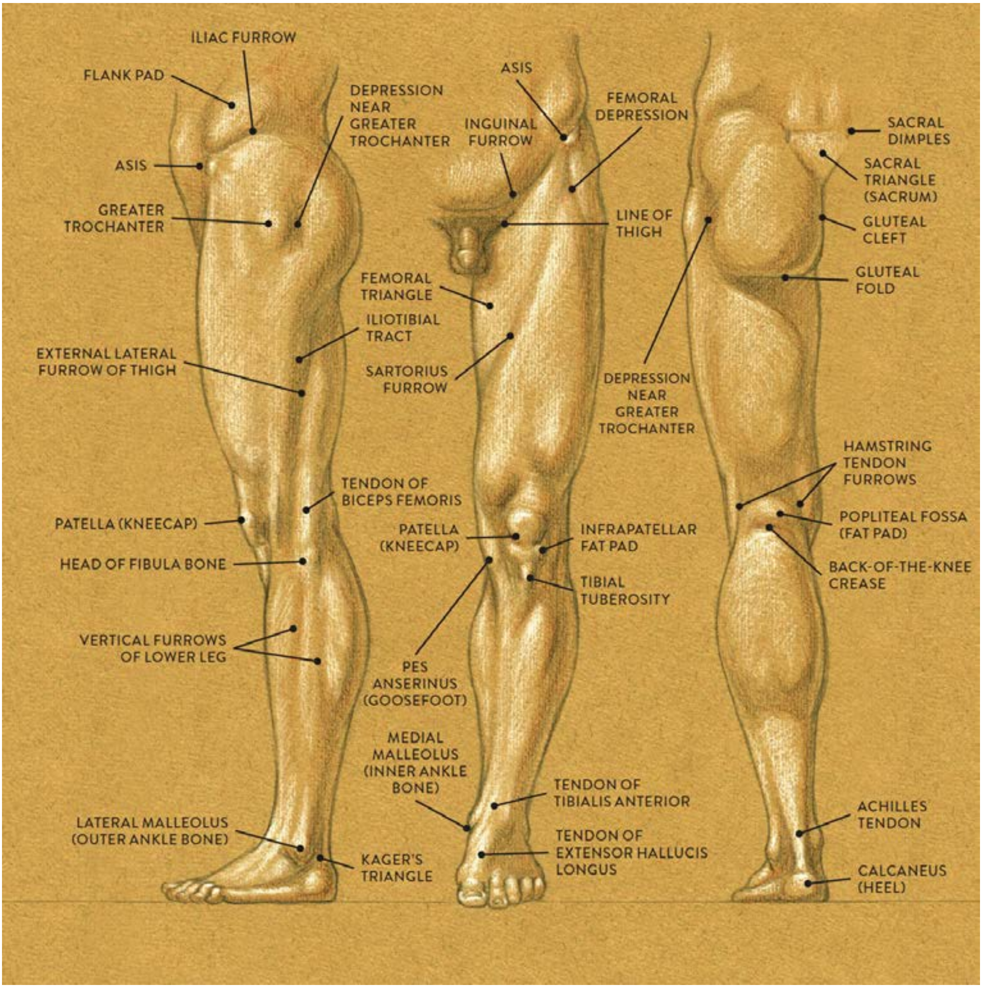


Graphite pencil and white chalk on toned paper.

Landmarks of the Leg and Foot

The following drawing gives a visual overview of the surface landmarks of the lower limb—the upper and lower leg—in lateral, anterior, and posterior views. The landmarks of each of these portions of the lower limb are discussed separately in the sections that

follow, as are the landmarks of the foot.



Left leg

LEFT: Lateral view

CENTER: Anterior view

RIGHT: Posterior view

Landmarks of the Upper Leg

Located on the front of the upper leg is a skin fold called the *line of the thigh* that marks

where the upper legs connect into the torso. As the upper leg bends, this crease becomes more apparent.

On very muscular legs, a very small triangular depression called the *femoral depression* occurs between the inner border of the sartorius muscle near its insertion at the ASIS and the outer border of the tensor fasciae latae muscle.

At the side of the upper leg, near the prominent bump of the greater trochanter of the femur, is a large depression or hollow in the skin referred to as the *depression near the greater trochanter* or the *retrotrochanteric groove.* Following the outer border of the iliotibial tract downward is an elongated furrow called the *external lateral furrow of the thigh.* This furrow helps indicate the division of the quadriceps muscle group and hamstring muscles on the outer length of the upper leg.

As the sartorius muscle descends from the ASIS, its inner edge can be seen as a subtle, trenchlike furrow, called the *sartorius furrow,* moving downward and diagonally on the thigh. The adductor muscle group is located between the inner thigh and inner border of the sartorius muscle. Part of this triangular region is called the *femoral triangle,* which is bordered by the inguinal ligament, the sartorius muscle, and the medial border of the adductor longus muscle. It is seen when the thigh is flexed, abducted, or laterally rotated.

The *pes anserinus* (goosefoot) is formed by three tendons of the upper leg—the tendons of the sartorius, gracilis, and semitendinosus—which all wrap around the inner condyles of the femur and tibia to insert on the inner side of the knee region. The pes anserinus has an egglike shape on the surface due to the small sacs of fluid (bursa) and the fatty tissue padding this area.

Landmarks of the Knee Region

Looking at the knee region of a standing leg from the front view, you see two similar rounded forms. The upper form is the *patella* (kneecap), which is bone; the shape immediately below, composed of soft fatty tissue, is called the *infrapatellar fat pad.* Another surface landmark in this region is the *patellar ligament,* which attaches from the patella into the small bump on the tibia called the *tibial tuberosity.*

At the back of the knee region is a skin crease called the *back-of-the-knee crease,* with the hamstring tendons positioned on either side. One of these tendons, from the biceps femoris muscle on the outer posterior region of the upper leg, has a thick, cordlike appearance. These forms are easily seen, especially in side and three-quarter views when the knee is flexed.

Landmarks of the Lower Leg

On muscular legs, noticeable ridges occur along the outer lower leg. These *vertical furrows of the lower leg* appear along the sides of the peroneus muscles, which subdivide the lower leg into three ridges of muscular form. Sometimes an additional ridge, of the soleus muscle, will also appear. These furrows are especially apparent on the lean but muscular legs of joggers, bicyclists, and other athletes who use their legs extensively. If the legs have a soft layering of adipose tissue, the divisions between the lower leg muscles will not be apparent.

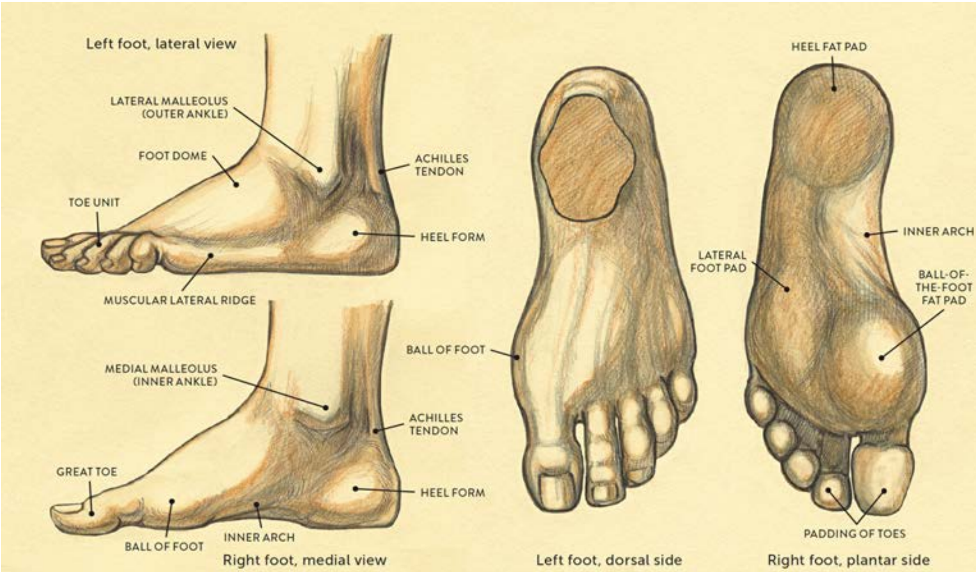
At the back of the lower leg, near the heel, is the *Achilles tendon* (*calcaneal tendon*). It descends from the calf muscles (gastocnemius and soleus) and tapers into a ropelike structure, inserting directly into the heel bone (calcaneus). *Kager's triangle* is the triangular space between the outer ankle and the Achilles tendon.

Landmarks of the Foot

The many bones of the foot are usually obscured—on the dorsal side by extrinsic tendons from the lower leg muscles, and on the plantar side (sole) of the foot by fat pads. The most noticeable tendons on the dorsal surface are the tendon of the tibialis anterior, the tendon of the extensor hallucis longus, and the four tendons of the extensor digitorum longus. The various pads of fat and extremely thick skin on the sole help protect it from friction and serve as shock absorbers.

Positioned on the bottom of the foot below the large toe is the *ball-of-the-foot fat pad,* which has a thick, round shape. Located on the bottom and sides of the heel, the oval-shaped *fat pad of the heel* is the thickest fat pad of the foot. This fat pad buffers the heel from the friction and impact it endures in the actions of walking, jogging, and running.

Along the outer edge of the foot, the abductor digiti minimi muscle forms an elongated muscular ridge. Overlapping this muscle is fatty tissue that sweeps around to the sole, creating an elongated teardrop-shaped fat pad referred to as the *lateral foot pad.*



The *fat pads of the toes* are positioned at the tips and sides of the last bone of each toe. When viewing from underneath, the toes look like fat beads or rounded wedge shapes. The fat pad of the great toe has a chubby heart shape. There are no fat pads on the inner arch of the foot, which usually does not touch the ground; the skin here is thinner than that of the rest of the sole.

The Subcutaneous Layer

Many of the body's surface landmarks are caused by muscles or portions of bones pushing close to the skin. The surface forms are, however, also influenced by the *subcutaneous layer,* also known as the superficial fascia, which lies between the skin and the deep fascia covering the muscles. This layer consists mainly of *areolar connective tissue* and *adipose connective tissue* (fatty tissue). The subcutaneous layer, which encapsulates virtually the whole body under the skin, varies in thickness from place to place. The fatty tissue layer can be quite thin in some locations, as on the bridge of the nose, or extremely thick, as in the region of the buttocks. It softens the definition of muscles by smoothing their contours, and it fills small spaces or hollows that occur between anatomical structures. Even extremely thin people have some small amount of adipose tissue within the subcutaneous layer. When an abundance of fatty tissue is present in the subcutaneous layer, it is called *subcutaneous fat.* When fat accumulates, it eventually alters the surface of the body, sometimes significantly.

The subcutaneous layer reacts to the dynamics of movement. Rolls in the flesh and deep creases and furrows in the skin can indicate that the subcutaneous layer is being compressed or stretched. An artist's awareness of the subcutaneous layer can give sensuality, radiance, liveliness, or luminosity to his or her depictions of the human figure, transforming a stiff or "robotic" figure study into one with a feeling of sensual vitality.

The superficial fascia of the subcutaneous layer attaches over the deep fascia by fibrous strands of collagen. The deep fascia, positioned beneath the superficial fascia, consists of thin, usually shiny membranes appearing as broad sheets; its function is to cover individual muscles or groups of muscles to help bind them together. The superficial fascia is thicker and contains small clusters of globular yellow forms of adipose tissue.

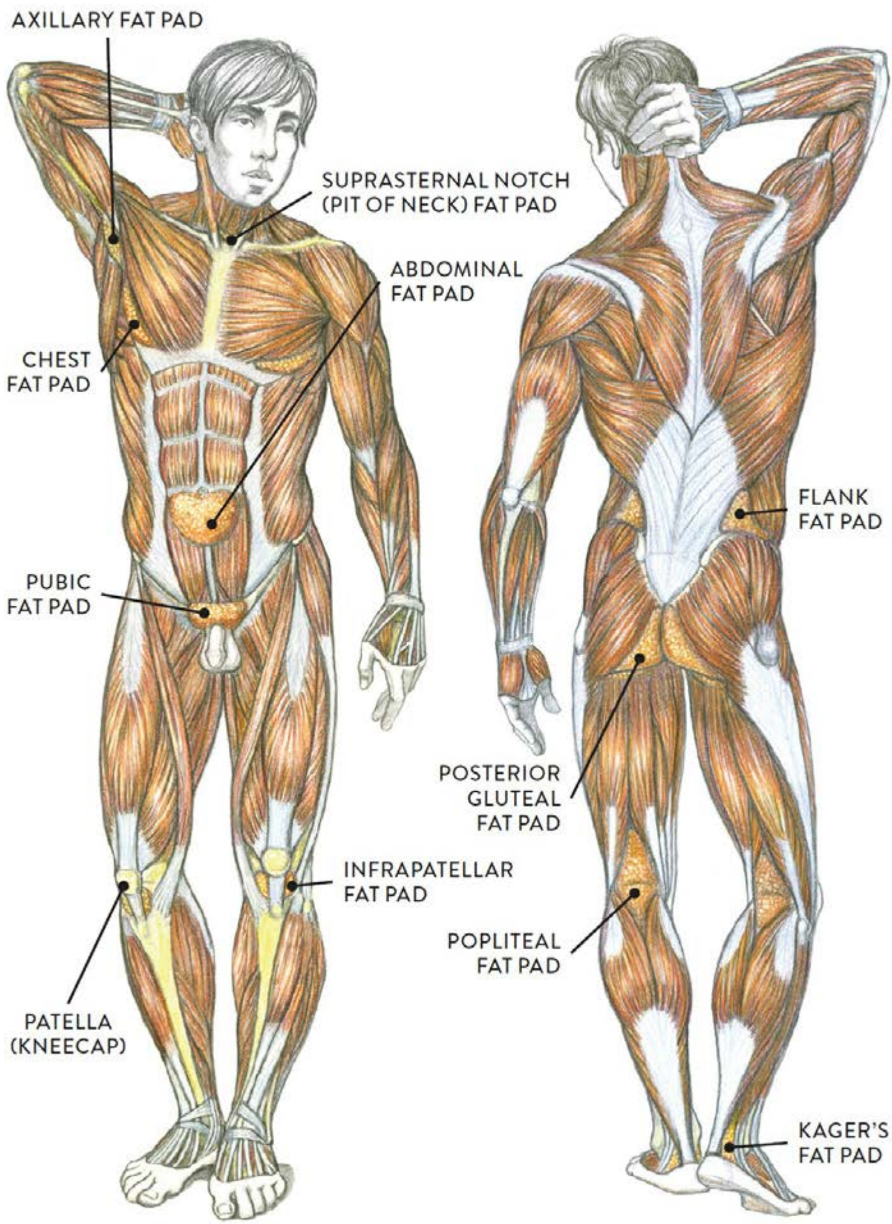
Even though the superficial fascia layer is firmly attached to the deep fascia layer, it has great elasticity and can move very easily when the body moves. For artists, it is very interesting to see how the soft tissues of the surface stretch and compress in different directions within various poses.

Fat Pads and Fatty Tissues

A *fat pad* consists of a fibrous tissue membrane containing closely packed fat cells. Anatomically necessary, fat pads function as shock absorbers, especially around joints (e.g., the infrapatellar fat pad of the knee), or act as cushions protecting nerves, blood vessels, and muscle layers from impact. Sometimes a fat pad is so well concealed by the skin and surrounding forms that it may be hard to see on the surface. In other areas, the padding softens muscular forms (e.g., the malar fat pad covering some facial muscles), creating a gentle transition from one form to the next. When depicting the figure, an artist should pay attention to any soft-tissue presence that might be essential to emphasize.

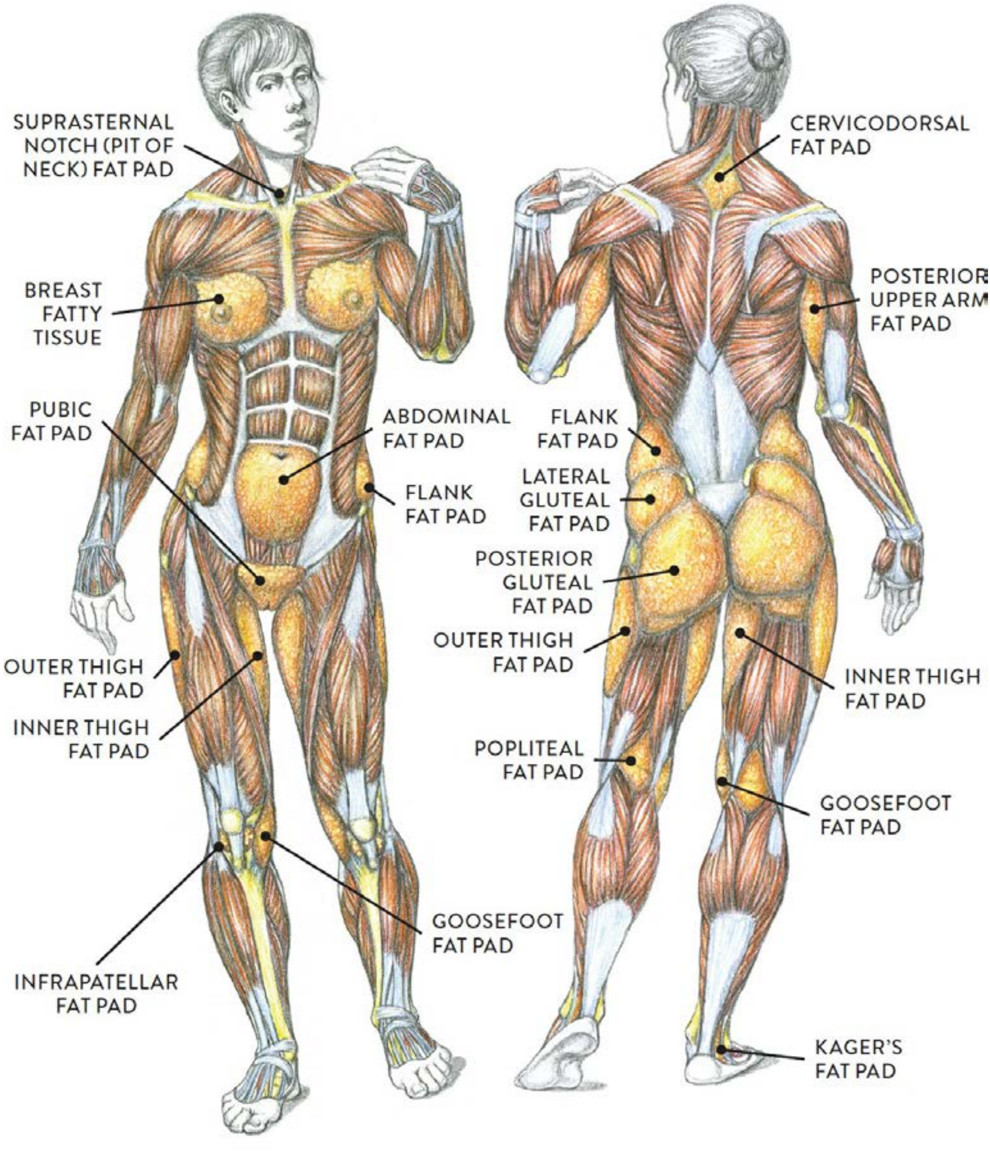
The following drawings show the general locations of fat pads and other noticeable fatty-tissue shapes throughout the male and female bodies. Do remember that most of the body is encased by a continuous thin layer of fatty tissue within the subcutaneous layer; in these drawings, that encompassing layer has been removed to show only the more obvious fat pads against the background of the superficial muscle layer.

GENERAL LOCATION OF FAT PADS AND FATTY TISSUE—MALE



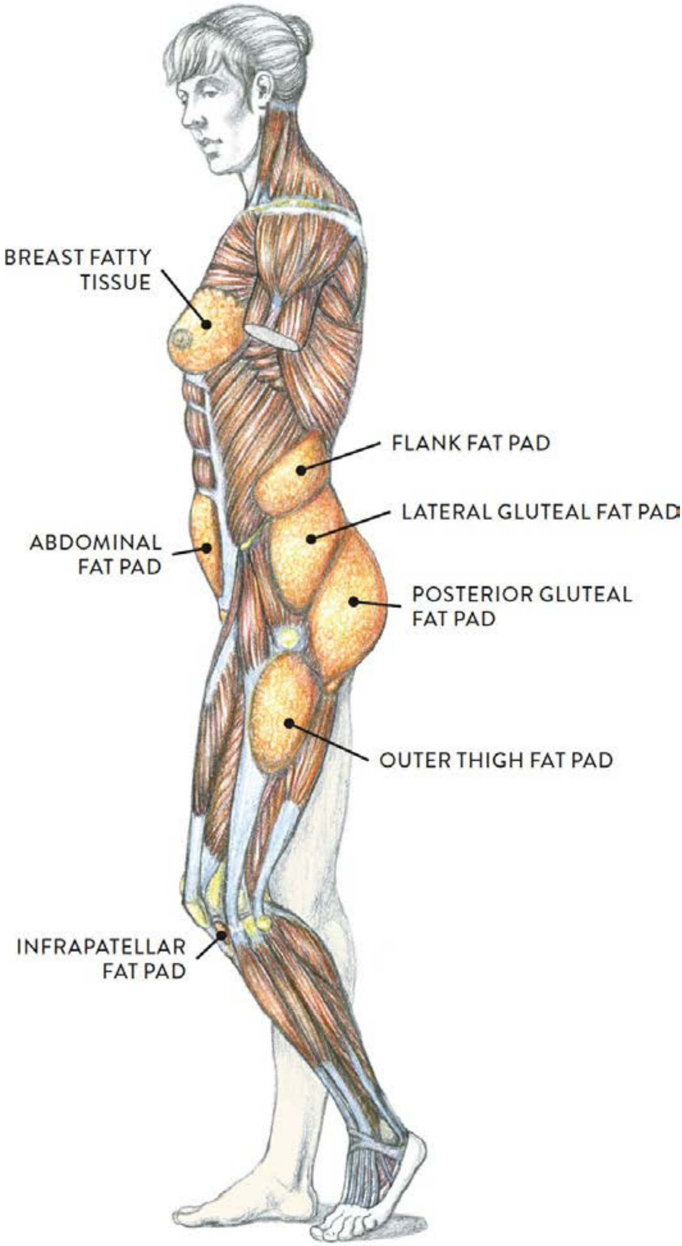
Anterior (left) and posterior (right) views

GENERAL LOCATION OF FAT PADS AND FATTY TISSUE—FEMALE



Anterior (left) and posterior (right) views

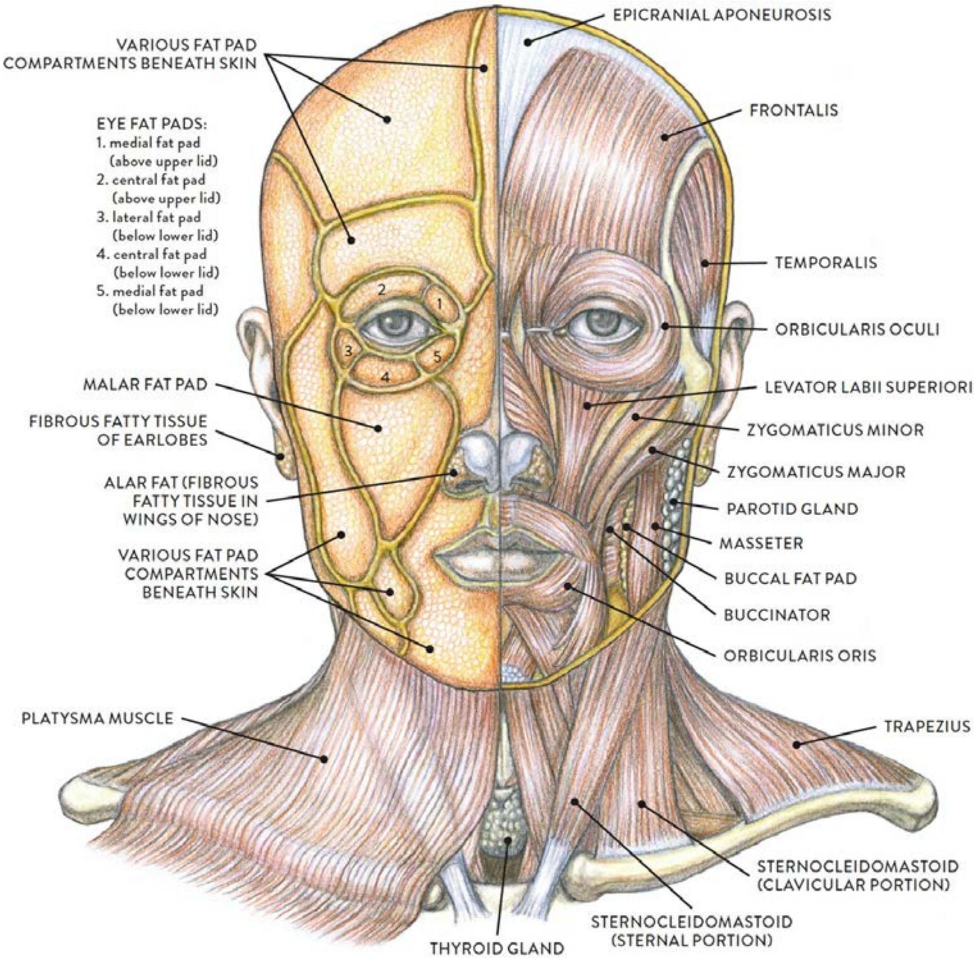
GENERAL LOCATION OF FAT PADS AND FATTY TISSUE—FEMALE



Lateral view

Fatty Tissues of the Face and Neck Region

Facial variations have much to do with the shape of the skull, but the placement of soft-tissue forms, including fatty tissues, gives the face its fleshiness and individual uniqueness. There are several compartments of fat on the face, but it is not important for artists to know each one. Being aware of the placement of these fleshy soft tissues can, however, help you avoid making the face look mechanical or robotic.



Left side: Fat pads and platysma muscle

Right side: Muscles and other soft-tissue forms

Youthful fleshiness, colloquially referred to as “puppy fat,” often gives way as a person matures. With the normal course of aging, the fatty tissues of the face become less prominent, making the face more angular. In the elderly, the fatty tissue often atrophies and begins to descend as the skin loses elasticity. This may give the upper region of the face a skull-like appearance and the lower portion of the face a sagging quality.

Several small fat pads above and below the lids of the eye flesh out the surrounding

eye socket. In the upper eye region, above the upper lid, are two fat pads:

The *central fat pad* (or *pre-aponeurotic fat pad*) is an elongated fat pad located above the eye but within the orbit; this fat pad may be more apparent on eyes with the epicanthic fold. There is no fatty tissue on the actual upper lid, so when depicting that form, keep the skin of the lid somewhat thin as it wraps over the ball of the eye. The smaller *medial fat pad* (or *nasal fat pad of the upper lid*) is near the inner corner of the upper rim of the orbit.

In the lower eye region, below the lower lid, are three fat pads: The *lateral fat pad* (or *temporal fat pad*) is near the outer region of the eye, situated within the orbit near the lower lid. The *medial fat pad* (or *nasal fat pad of the lower lid*) is a small fat pad located on the medial (inner) part of the eye near the nose. The *central fat pad* is an elongated pad of fat located in the central portion of the bottom rim of the eye socket, directly below the lower lid. In the elderly, these pads become more apparent on the surface as they sag over time, creating what are called "eye bags."

The mid-face region has two main fat pads: the more superficial *malar fat pad* and the deeper *buccal fad pad.* The triangular malar fat pad, on the front region of the face directly beneath the skin, partly covers the straplike zygomaticus minor and levator labii superioris muscles, giving the face its fleshy appearance. The malar fat pad is positioned close to the outer part of the orbicularis oris muscle (the round muscle of the mouth) near the nasolabial fold. While the pad often softens the surface in this area, it can appear as a triangular hollow or depression in a leaner face. In an elderly face, this fatty tissue usually sags, creating a much more pronounced nasolabial fold.

The *buccal fat pad* (or *Bichart's fat pad*) is an deep, elongated fat pad positioned between the buccinator and masseter muscles. While we don't usually see this fat pad on the surface, it does help fill in the spaces between the various muscles on the face.

Embedded within the superficial fascia of the neck is a very thin muscle called the *platysma* (see this page). On a young person this muscle is so thin that it is not noticeable unless activated in certain facial expressions or when the lower jaw is thrust forward. In the aging process this muscle loses its elasticity and begins to sag. The fatty tissue in the neck's superficial fascia also begins to dissipate, becoming rather thin, unless the person has an abundance of fatty tissue, in which case the area under the chin and parts of the neck become thicker.

When someone has moderate to excessive layers of fat in the face and neck region, the *submental fat pad* under the chin can enlarge, producing what is colloquially known as a "double chin." This extra fatty tissue often obscures the edge of the jawline as well, softening it to a curve. As a person ages, this fat pad tends to drop down slightly and bulge (herniate) between the divisions of the platysma muscle on the front of the neck, accentuating platysma banding.

A small amount of fatty tissue, called the *suprasternal notch fatty tissue* (or *pit of the*

neck fat pad) occupies the suprasternal notch (pit of the neck), between the inner ends of the sternocleidomastoid tendons and the top portion of the sternum (breastbone). Generally there is not enough fat in this area to soften it out completely, so a small depression is still seen in the skin.

Fatty tissue sometimes accumulates in the area around the seventh vertebra at the base of the neck and in the mid upper back. This *cervicodorsal fat pad* (or *dorsocervical fat pad*) can become quite thick, appearing as a large bulge sometimes colloquially referred to as a "buffalo hump." The cervicodorsal fat pad is more noticeable in obese people and the elderly (in both sexes, but mainly in females).

Fatty Tissues of the Torso

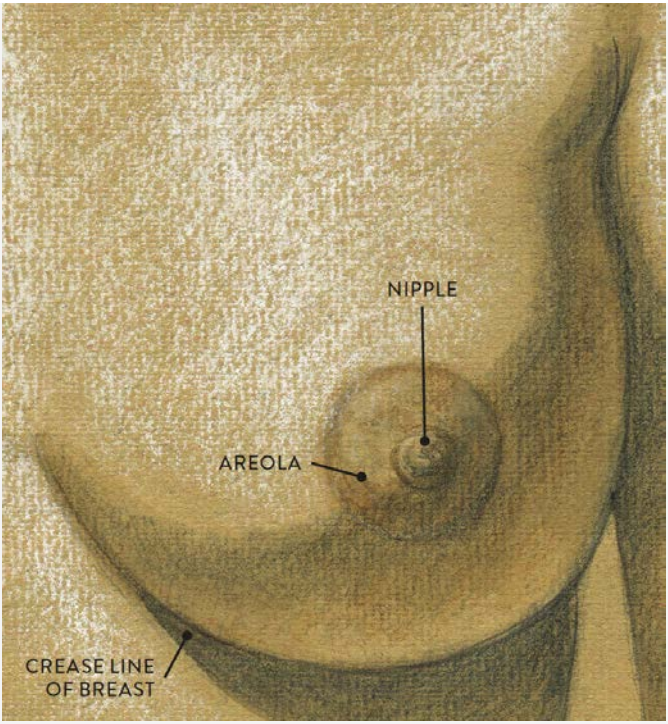
On the front of the female torso, the breasts are composed of mammary glands, fatty tissue, and connective tissue containing supportive fibrous ligaments. The fatty tissues in which the mammary glands are embedded (called *breast fatty tissue* or *mammary fat tissue*) give the breasts their overall shape. In the male chest, small, crescent-shaped pads of fatty tissue occur along the lower outer border of the pectoralis major muscle. In muscular men, these give an angular look to the forms of the chest, but in obese men, these pectoral fat pads, as well as the accumulation of excess adipose tissue generally, enlarge the forms of the chest into bulbous shapes similar in appearance to female breasts.

Breast shapes vary from woman to woman. They can be cone shaped, especially in young women, or melon shaped if there is an abundant amount of fatty tissue. In elderly women, breasts tend to look deflated, slumping on the rib cage, in part because the fatty tissue dissipates over the years.

Characteristics of the Breast

At the center of the breast form are the *nipple and areola,* shown in the following drawing. The nipple is a small cylindrical form projecting from the center of the areola, which is a ring of pigmented skin. The color of the areola varies among individuals, ranging from peachy and rosy colors to various shades of brown. The nipple contains an involuntary muscle which also affects the shape of the areola. In cooler temperatures, the nipple is erect and the areola contracts slightly. In warmer temperatures, the areola assumes its full disk shape and the nipple softens. In arousal, the nipple is erect and the areola is at its full shape. In males, the nipple and areola tend to be smaller and positioned lower on the chest form.

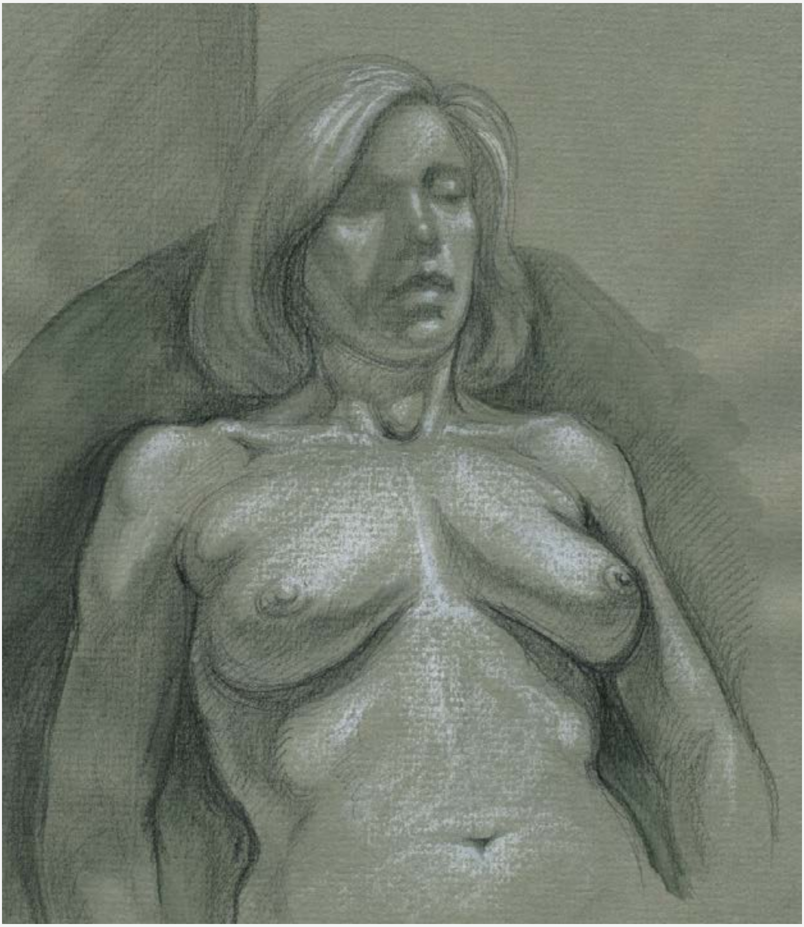
NIPPLE AND AREOLA OF BREAST



Left breast, anterior view

The breast form is quite movable on the rib cage and changes shape from pose to pose. When a woman lifts one arm overhead, the breast on that side stretches upward. If she is lying on her side, both breasts are affected by gravity and droop slightly downward. When she lies on her back, the breasts tend to flatten out from the midline, and the outer portions of the breasts roll outward, as shown in the life study *Female Figure Leaning Back,* below. Crossing the arms tightly in front of the torso presses the breasts closer together, forming a cleavage. If the woman leans forward, the breasts hang slightly away and downward from the rib cage, appearing pendulous. When the torso is vertical, with the arms at the sides, the breasts appear to gently fall away from the breastbone. Fatty tissue does not deposit directly on the breastbone, so there should always be a thin neutral space between the breasts. As just mentioned, however, gravity can affect the position of the breast, and its shape can cross over and in front of the breastbone in certain poses.

FEMALE FIGURE LEANING BACK



Graphite pencil, watercolor wash, and white chalk on toned paper.

The bulges at the outer sides of the lower torso below the waist are the flank pads of the external oblique muscle. A fat pad called the *flank fat pad* (or *posterior fatty cushion*) is located on the posterior lower portion of this muscle. When there is excessive fatty tissue present, the flank fat pad becomes larger, sometimes covering the entire lower portion of the external oblique muscle. Colloquial terms such as “spare tire” and “love handles” refer to excess fat on the sides of the waist around the flank portion. On women the flank fat pad surrounds the side of the torso, blending with the

lateral gluteal fat pad (see this page), which covers the upper border of the pelvis (iliac crest). The anterior portion of the iliac crest (ASIS) is not covered by either muscle or fat and can usually be seen as a small bony protrusion or a dimple on the surface.

The *lateral gluteal fat pad* is located over the gluteus medius muscle, on or near the iliac crest of the pelvis. In individuals with substantial fatty tissue, the lateral gluteal pad merges with both the flank fat pad and the *posterior gluteal fat pad,* which is positioned directly over the gluteus maximus muscle, giving this area a smooth, rounded appearance. This fat pad does not cover the sacrum, sacral dimples, or greater trochanter of the femur.

On women, the posterior gluteal fat pad is usually more prominent than on men, blending with the lateral gluteal fat pad and the *outer thigh fat pad* to create a single mass. On more muscularly defined women, as on men, the posterior gluteal fat pad is relatively thicker in the lower region but minimal on the rest of the muscle. A furrow is sometimes noticeable immediately near the greater trochanter, which is where the gluteus maximus directly attaches into the iliotibial tract. But if the hip and upper leg have an excess amount of fatty tissue, this furrow is softened and hard to see. In the elderly, the fat in the buttock region dissipates and drops slightly downward as the connective tissue of the fascia loses its elasticity, resulting in the widening and flattening of the buttocks.

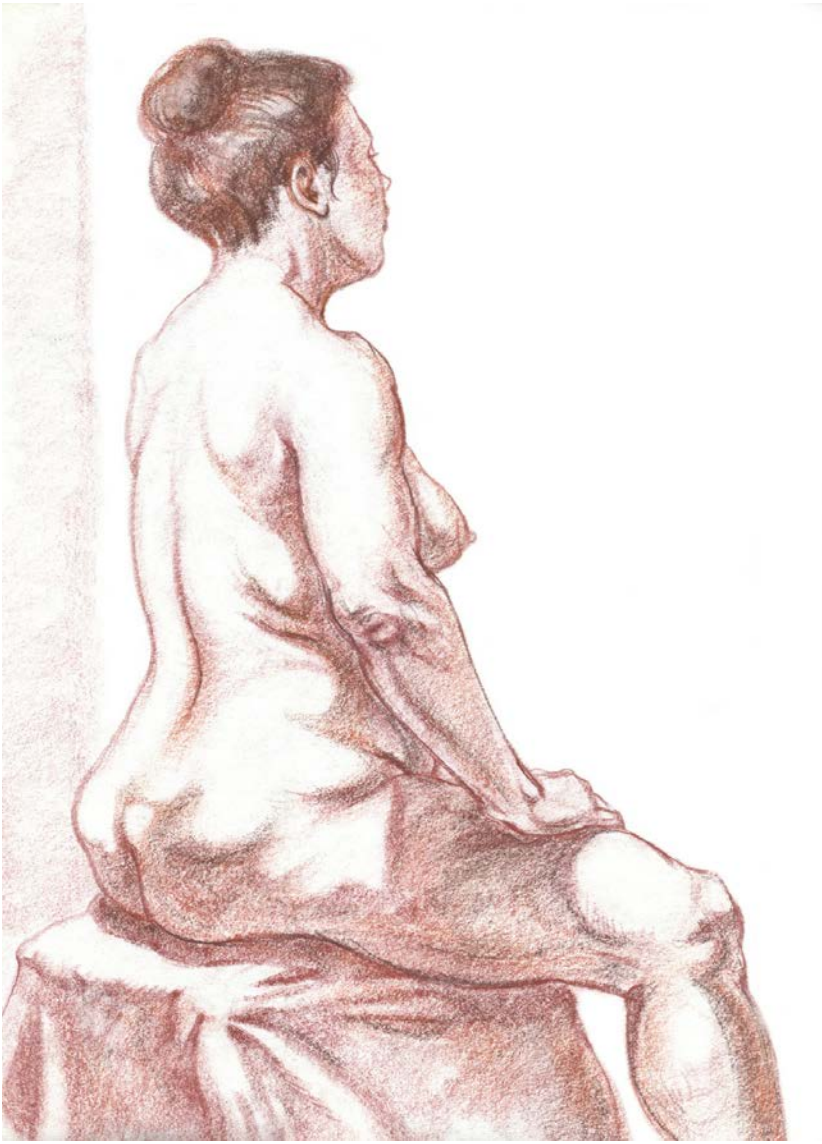
Embedded in the superficial fascia over each buttock is a slinglike fibrous tissue band called the *buttock suspensory ligament.* The fatty tissue contained by these slings gives the buttocks their characteristic shape. The gluteal fold (see this page) prevents the thick fatty tissue from moving downward against the hamstring muscles of the posterior upper leg, but some people have an extension of fatty tissue below the gluteal fold, referred to simply as the *fat pad below the buttocks.* If the fatty tissue is abundant in this area, there might be an additional skin crease (called the *gluteal sulcus*), and the fat pad's shape can resemble a banana. When the upper leg bends, the fatty bulge and skin crease temporarily disappear.

Within the perimeter of the sacrum is a very thin deposit of fatty tissue referred to as the *sacral fat pad* (or *lumbosacral fat pad*). On some individuals this padding is slightly more abundant, creating a soft triangular shape within the sacrum region.

The *abdominal fat pad* (or *Camper's adipose layer*) is subcutaneous fat located over the lower portion of the rectus abdominis muscle. It begins near the waist, surrounds the navel, and tapers toward the pubic bone, giving a soft appearance to the abdomen's surface. In the presence of this superficial fat, the navel becomes a small, deep depression. *Visceral fat* (also called *intra-abdominal fat* or *organ fat*) is not subcutaneous fat; it is found in the abdominal cavity *under* the abdominal muscles. It serves as "packing material," surrounding and supporting the organs. When there is an overabundance of this fat, as in extremely obese people, the abdomen significantly protrudes in what is colloquially called a "beer belly" or "potbelly." The clinical term

is *abdominal obesity.*

The life study *Full-figured Female from the Side,* shows how abundant fatty tissue is situated on the torso, especially in the pelvis region.



Sanguine and brown Conté crayon on newsprint.

A fat pad called the *pubic fat pad* (also known as the *mons pubis, mons veneris,* and *mount of Venus*) is positioned on top of the pubic bone and immediately below the inguinal ligament of the external oblique muscle, which attaches directly into the pubic

bone. This pubic fat pad creates an obvious triangular shape in women. In men, the pubic fat pad is more subtle; it does, however, create a bridge of fatty tissue positioned directly beneath the inguinal ligament (the curving furrow from each ASIS to the pubic bone) and the line of the thigh (a skin fold that marks where the upper legs connect into the torso). In elderly men, this fat pad can become quite prominent, tending to sag downward.

Fatty Tissues of the Arm and Hand

There is usually a layer of fatty tissue located in the posterior upper arm region, around the outer head of the triceps muscle near the deltoid. This *posterior upper arm fat pad* tends to be more common in women.

Axillary fatty tissue (also called *axilla fatty tissue* or *axillary fat*) fills in the hollow of the armpit, covering the intersection of the several muscles that connect with the humerus in this location. This fatty tissue protects the nerves, blood vessels, and lymph nodes located in the armpit region.

The palm side of the hand is thick with muscular forms and fatty tissue, as shown in the following drawing, while the back of the hand shows very little evidence of fatty tissue. The palm's superficial fascia consists of dense fibro-fatty tissue that is firmly attached to the palmar aponeurosis and covers the two muscle groups of the palm (the thenar group and the hypothenar group), serving as a protective padding for the palm area. There is also an elongated cushion of fibrous fat located at the base of the fingers on the palm side. Fat pads are also positioned on the palmar side of each finger, particularly in the vicinity of the fingertips, and on each thumb.

FAT PADS OF THE PALM

Study of Hand, Palm View

Graphite pencil, ballpoint pen, and sanguine colored pencil on white paper.

Diagram of fat pads

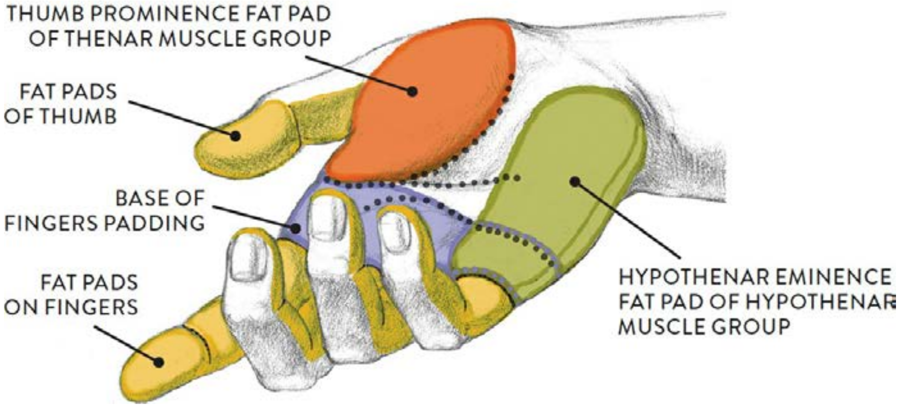
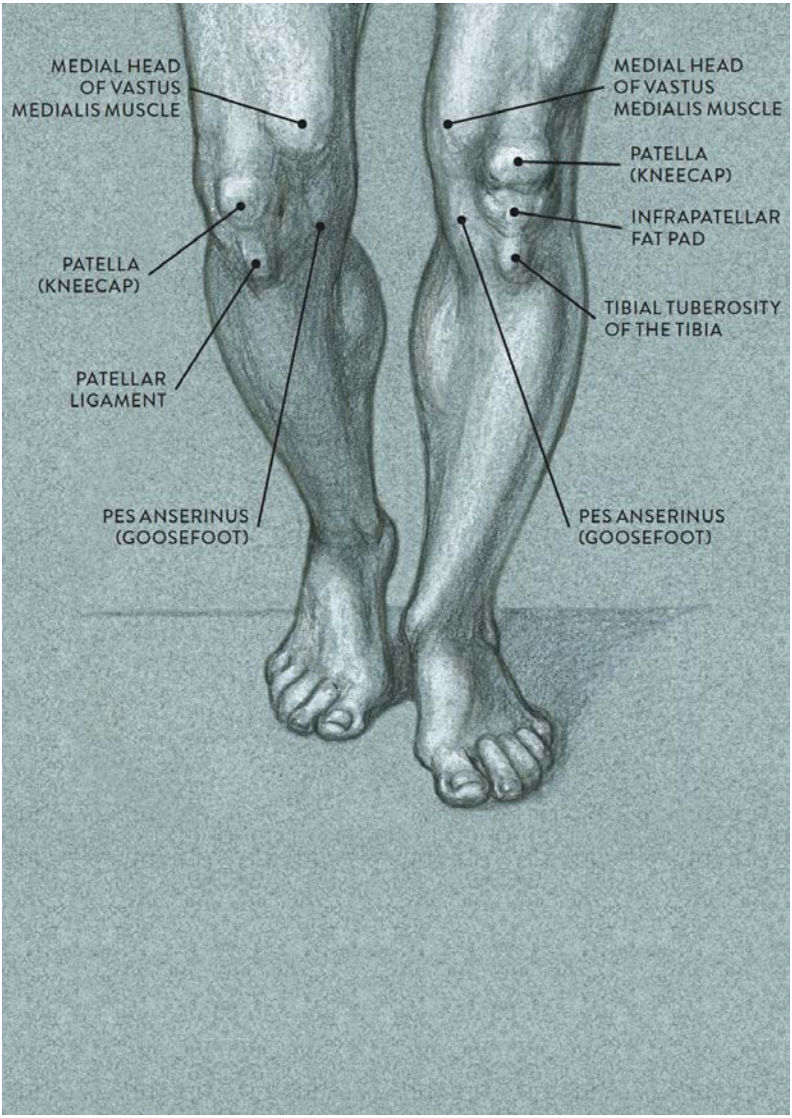


Diagram of fat pads

DOTTED LINES: FLEXOR CREASES OF PALM

Fatty Tissues of the Leg

The upper leg region has various fat pads, mainly on the inner and outer thighs, as well as in the knee region. On muscular legs, the fat layer is minimal, except perhaps around the knee joint.



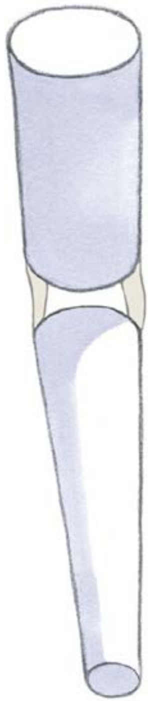
Ballpoint pen, graphite pencil, gray marker, and white chalk on toned paper.

The *outer thigh fat pad* (or *subtrochanteric fat*) is a fatty distribution covering a portion of the outer quadriceps muscle (vastus lateralis) and usually positioned below the greater trochanter bone of the femur. (This partly explains why we can see the knoblike form of the greater trochanter in many views of the leg.) In women, the outer

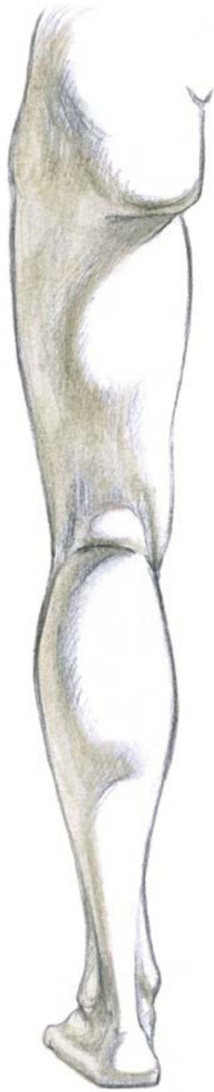
thigh fat pad usually blends with the posterior gluteal fat pad, creating a continuous softened shape throughout the hip and buttock region and making women's hips appear wider than men's, sometimes resembling flaring riding breeches. Another fat pad, called the *inner thigh fat pad,* is located on the upper half of the inner thighs and covers part of the adductor muscles.

The *infrapatellar fat pad* (or *fat pad of the knee*) is located on the front of the leg directly below kneecap (patella). It is positioned behind the patellar ligament—the straplike form running from the patella to the tibial tuberosity of the tibia bone. When the leg is straight, this fat pad can be quite prominent in all body types, often resembling a softened heart-shaped form. When the leg bends, the patellar fat pad is no longer noticeable on the surface. *Study of a Pair of Legs and the Knee Region,* on this page, shows the infrapatellar fat pad and other surface landmarks of the knee region.

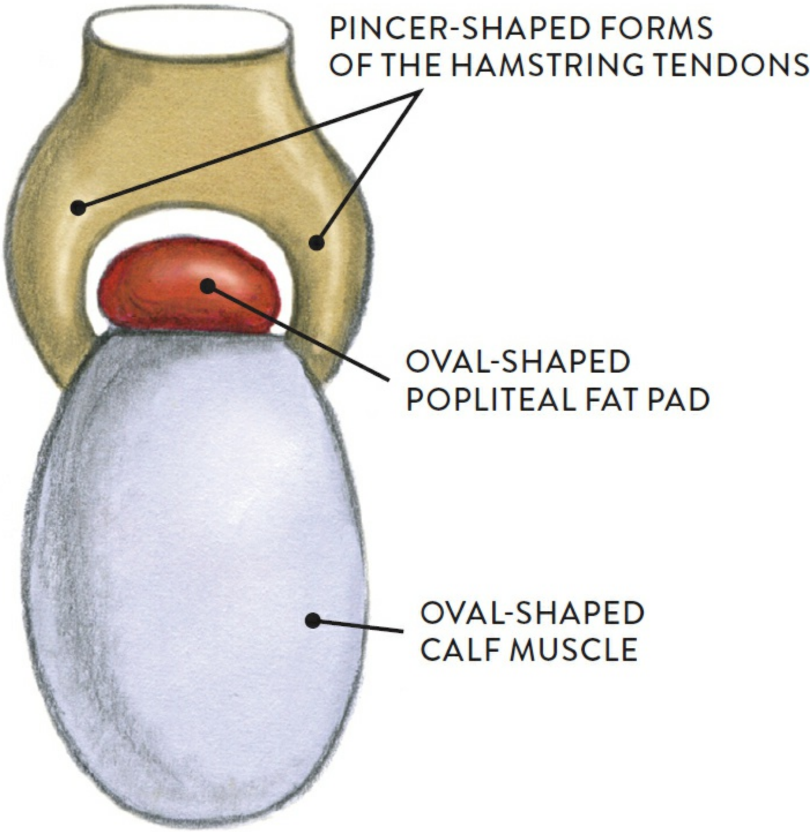
At the back of the knee region is a diamond-shaped hollow, called the *popliteal fossa*, between the tendons of the hamstring muscles and the upper portion of the calf muscle (gastrocnemius). Within this hollow is a small pad of fat, called the *popliteal fat pad,* that acts as a cushion for the joint and helps protect the nerves and blood vessels in this space. When the leg is straight, the fat pad appears as a bulge positioned directly above the back-of-the-knee crease and between the hamstring tendons. Shallow vertical grooves appear in the skin next to the tendons on either side of the bulging fat pad. When the leg bends, the fat pad disappears from view and a deep hollow is seen, along with the prominent hamstring tendons. The differing appearances of this region are shown in the following drawing.



Bent leg shows hollow in popliteal fossa.



Straight leg shows fat pad in popliteal fossa.



Basic shapes for back of knee region.

On the inner side of the knee is the attachment site for three tendons from the sartorius, gracilis, and semitendinosus muscles. These tendons wrap around the inner condyles of the femur and tibia and form a tendinous triangle called the *pes anserinus,* meaning "goosefoot." (The tendons' webbed appearance is similar to the foot of a goose.) Small sacs of fluid (*pes anserinus bursa*) are positioned between the tendons, giving this area a slightly thickened form. On some individuals (especially women), a pad of fatty tissue (the *goosefoot fat pad*) is distributed over the tendons of the pes anserinus, creating a large egglike shape on the surface, especially in a standing leg. This surface form is

positioned slightly lower than the inner head of the vastus medialis muscle of the quadriceps. When the leg bends at the knee, the fatty tissue becomes less prominent or completely disappears, revealing the medial condyles of the femur and tibia bones.

A small amount of fatty tissue called the *Kager's fat pad* (or *pre-Achilles fat pad*) occupies the triangular space called the Kager's triangle between the Achilles tendon, the top portion of the calcaneus (heel bone) and the posterior edge of the flexor hallucis longus muscle and its tendon.

The several fat pads of the sole of the foot have already been introduced, above (see this page).

SITTING FIGURE DEPICTED IN PLANES

Pen and gray markers on white paper.

Chapter 9

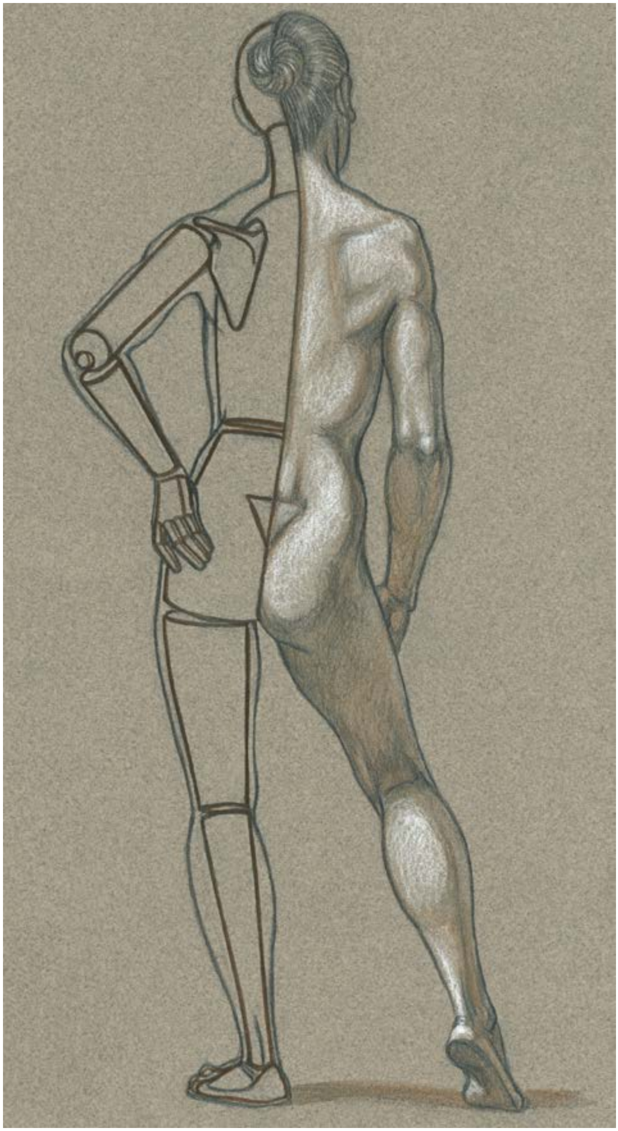
Structures and Planes of the Figure

This chapter begins by exploring how to set up preliminary structures when drawing the human figure. While some artists prefer to start a drawing of the figure *without* creating any preliminary structure, many others find this training beneficial, because it enables them to quickly draw figures in motion and to draw the figure from memory more accurately. The last part of the chapter examines an alternate but related approach: using the planes of the body to analyze anatomical forms, transforming them into simple geometric shapes.

Preliminary Structures

Beginning a drawing by determining the basic structure of the figure is a technique that goes by many names: the *manikin approach,* the *armature approach, "blocking in," constructing the figure, structuring the figure, preliminary drawing,* and so on. All these terms, however, point to the same fundamental purpose: helping the artist establish a basic framework for the figure.

Many artists begin longer studies—usually anything over ten minutes and up to several hours—with a simplified preliminary drawing of the pose. This is almost like doing a gesture drawing of the pose (see Chapter 10), but it results in a more stable and accurate structural shape. When you start off with a light preliminary drawing, you are, in a way, creating an armature for the later application of organic anatomical forms, much like a sculptor who builds a wire armature and then adds clay to it. Creating such an armature will minimize unintentional distortion when you add the elements of three-dimensionality to the figure. The drawing at right shows how the structural drawing acts like an armature beneath the finished forms of a figure study. The sidebar on this page lists some of the advantages of setting up a basic structure before proceeding to a finished drawing.



Half structure/half figure

The bones of the human figure are the actual anatomical armature, and indicating the presence of bony landmarks in your studies helps create a more convincing figure. But we do not see evidence of most bones on the surface form, because they are largely

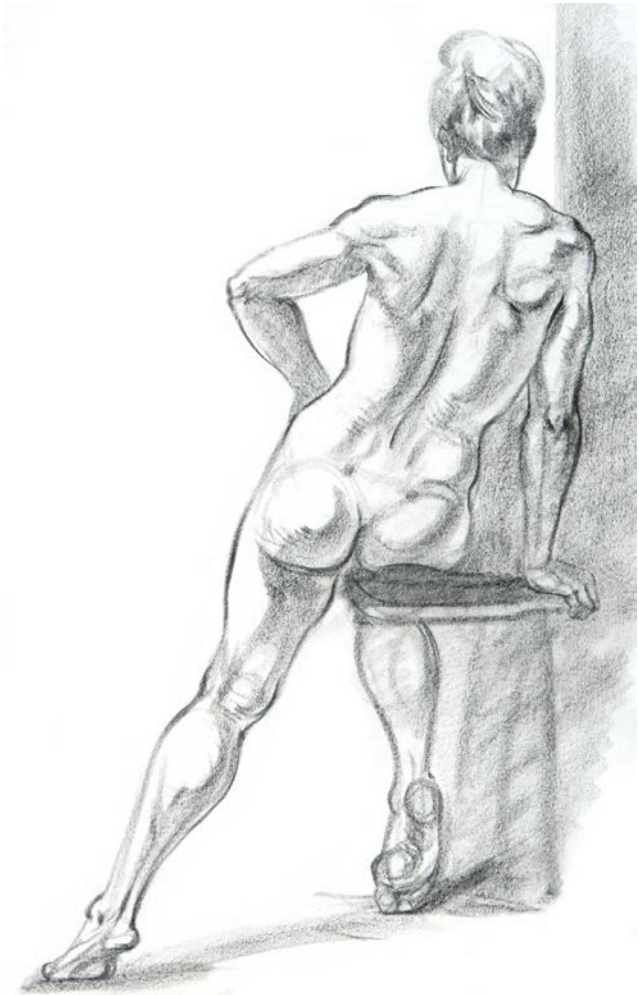
covered with muscle and other soft-tissue forms. In creating your armatures, therefore, you have to simplify a body region into a geometric shape or shapes that help position it within a coherent structure of the whole figure.

For example, although we may not see much evidence of the bone of the upper leg (femur) on the surface of the figure, we do see the strong cylindrical shape of the thigh created by the femur and the various muscles and soft-tissue forms attaching to it. So a simple cylindrical shape serves well as a representation of the thigh.

The shapes you use for the armature will differ according to the body part and its position in a pose. Oval and egg shapes are standard for the head, as well as for the rib cage. The limbs are easy to block in using elongated rectangular shapes or cylinders. The pelvis is somewhat harder to define as a bone shape, but a geometric shape such as a wedge, square, or oval may work well, depending on the position of the pelvis. And you need not restrict yourself to strictly geometric shapes; organic shapes, such as kidney bean shapes for torsos or pear shapes for wider hips, can also be used. As you can see, I used a variety of shapes—some geometric, some organic—in the preliminary structure for *Study of a Female Figure from a Back View*.

PRELIMINARY STRUCTURE FOR “STUDY OF A FEMALE FIGURE FROM A BACK VIEW”

STUDY OF A FEMALE FIGURE FROM A BACK VIEW



Black Conté crayon on newsprint.

Advantages of Setting Up a Preliminary Structure

Most of the structural drawings throughout this chapter have heavily drawn lines so that you can see the shapes clearly. When drawing from an actual model or a photo source, however, you should indicate the structural shapes with very light lines. Here are some of the advantages of creating a lightly drawn preliminary structure before moving on to the surface planes, anatomical forms, and details of the figure.

Placing the figure on the page

The lightly blocked-in armature will enable you to see whether the figure is properly placed on the page. If you're drawing the entire figure, are you giving yourself enough room to capture the entire pose? If you intend to crop the pose in your drawing, is the composition as you want it to be? Blocking in the figure lightly on the page will give you a "sneak preview" of how the finished drawing will look. If you need to readjust something compositionally, this is the moment to do it, when the marks are light enough to easily erase.

Quickly checking proportions

The blocked-in armature allows you to quickly assess the basic proportions before you get too involved with the detail of the figure. If you start filling in the details right away, you may be at risk of recognizing a proportional error *after* it becomes difficult to erase what you've done. By establishing a light armature first, you can see whether anything needs to be readjusted structurally or proportionally *before* you begin applying the anatomical details.

Making alterations within the pose

There will be times when you'll be working from a model and will realize that some portion of the pose looks awkward. No matter how many times you accurately redraw that area, it will still appear "out of place." Starting with a lightly drawn armature allows you to solve the issue by altering the pose in your drawing. For instance, if you feel that one of the model's legs would work better visually if positioned at a different angle, it is very easy to adjust the lightly drawn structure of the leg to see if your idea will work. Although this option might not appeal to artists who prefer to draw *exactly* what they see in front of them, others will choose to adjust their study to make the pose more dynamic or the overall composition more interesting.

Drawing from memory

One reason I encourage artists to work with preliminary structures is that it helps you draw figures from memory. Artists who use underlying structures realize after a time that they can draw various poses from memory or imagination. The ability to draw from memory can give you more confidence even when working from a live model or photo source, since you'll be able to alter the pose from memory if you feel the need to do so. Drawing from memory is a great way to practice figure drawing when there is no model or photo source available. You can structure a pose from memory or imagination and then add the anatomical surface forms. This is a useful skill when trying out possible poses for a painting or sculpture or laying out a sequence for a storyboard or comic book panels.

The key when establishing an armature or manikin structure is to make sure you draw it very lightly. Heavy, dark structural lines will compete with your more finished line work and give your drawing a cluttered look. The lightly drawn structural lines are meant only as guides for the later application of anatomical forms. When the drawing is almost finished you may erase any structural lines that are still visible.

If you are planning to work your drawing in charcoal pencil, Conté crayon, or pastel pencil, I recommend that you first block in your armature in vine charcoal because it is very easy to erase or smear out later. If you are working in pen, begin the preliminary armature with a semisoft graphite pencil, such as HB or B. Again, you can erase all evidence of the penciled-in structural lines once the pen work is finished. If you like, you can leave some of the structural lines in the finished drawing as part of the statement. But

if the drawing is done on toned paper and you will be adding white chalk highlights where there are some underlying structural lines, you should definitely erase all evidence of the armature before adding the white chalk. Otherwise, it will create a smeared gray tone rather than the clean white gradation of values you want.

Structures for the Head

The basic structure for the head is usually an oval or inverted egg shape, especially for front and three-quarter views. If there is some foreshortening, as when the head tilts forward or back, then a three-dimensional block or cylinder shape might serve better. Some artists prefer drawing a simplified skull shape before building up the anatomical forms.

In any pose of the head, the neck and shoulders should also be indicated or at least suggested. The neck supports the cranium, especially when the head is tilting or rotating, and indicating the shape of the neck helps accentuate and counterbalance these actions. Once the basic structures of the head, neck, and shoulders are lightly drawn, locate the central axis, or midline, of the head, using it as a guide when applying the planes of the head and face, the facial features, and other details.

Frontal Views of the Head

First, observe how the head, neck, and shoulders are positioned in space. In a traditional portrait view, the eye level of the model is aligned with the eye level of the artist. When drawing a *frontal view of the head*—in which the model is directly facing you—draw the central axis, or midline, as a straight vertical dividing the head into equal halves. Next establish the location of the *eye line,* on which the pair of eyes will be placed. This is generally placed halfway between the top of the head and the bottom of the chin. Then locate and draw the *brow line* (for placing the eyebrows), the *nose line* (at the base of the nose), and the *mouth line* (at the base of the lower lip). All these lines for the placement of the features run perpendicular to the central axis of the head.

If the head is facing you but tilting to the left or right, the central axis should match the angle of the tilt. The lines for the features will now be angled—but always perpendicular to the line of the central axis.

Three-quarter Views of the Head

If the model's head is rotated away from you in a *three-quarter view,* the central axis is no longer in the exact middle of the head but rather off-center to a greater or lesser degree. The facial forms on the far side of the central axis will be more condensed,

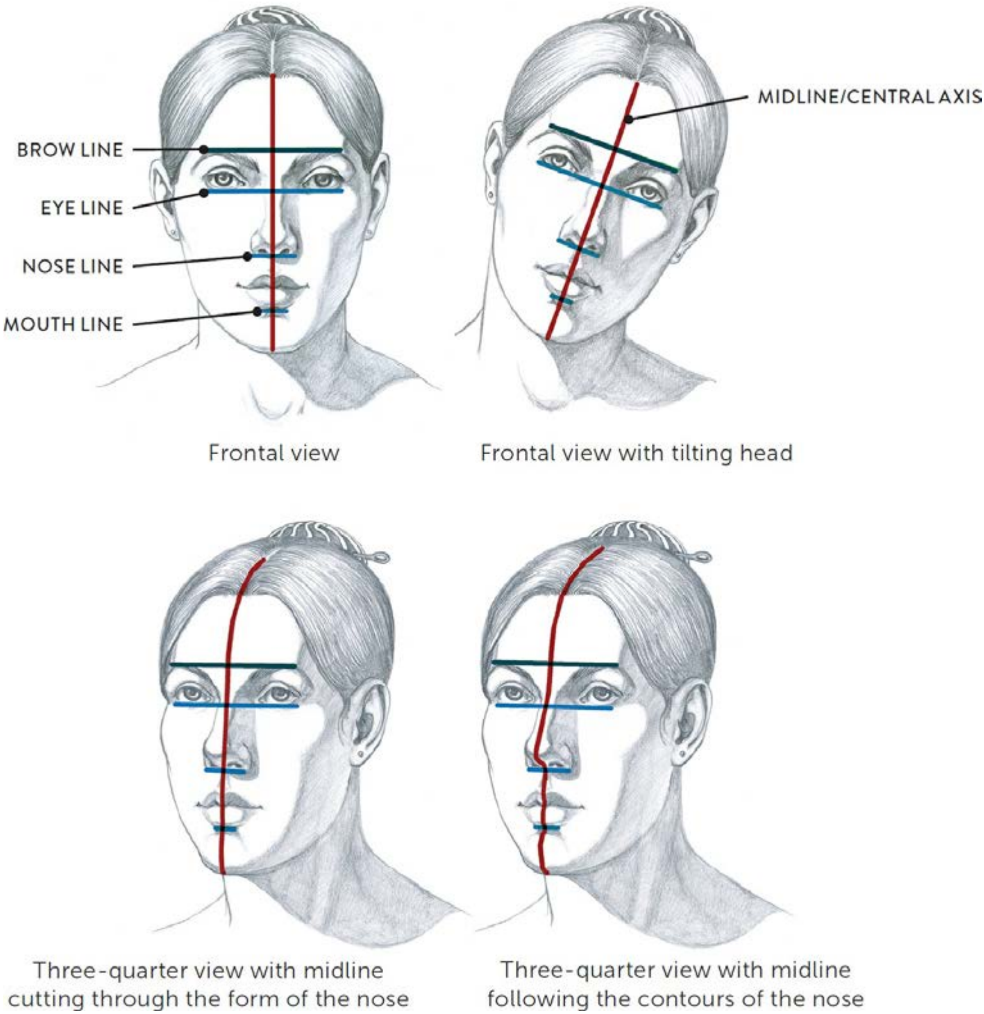
depending on how much rotation is occurring.

There are many possible degrees of the so-called “three-quarter” view. If you observe a model facing you and then slowly turning his or her head until you see the model’s profile, all the positions of the turning head between the full frontal and full profile views are considered three-quarter views. At each position the head looks slightly different, and the midline must be placed differently in each view.

The following drawing shows a frontal view of the head, a tilted head (facing front), and two drawings of the same three-quarter view. All the views indicate the placement of the midline, or central axis, of the head as well as the lines for the various features. The two three-quarter drawings show two different ways of indicating the midline. In one, the midline travels straight down, cutting through the structure of the nose; in the other, the midline follows the contour of the nose.

MIDLINE/CENTRAL AXIS OF THE HEAD

Showing the placement of the brow, eye, nose, and mouth lines.



Frontal view

Frontal view with tilting head

Three-quarter view with midline cutting through the form of the nose

Three-quarter view with midline following the contours of the nose

Checking Your Eye Level

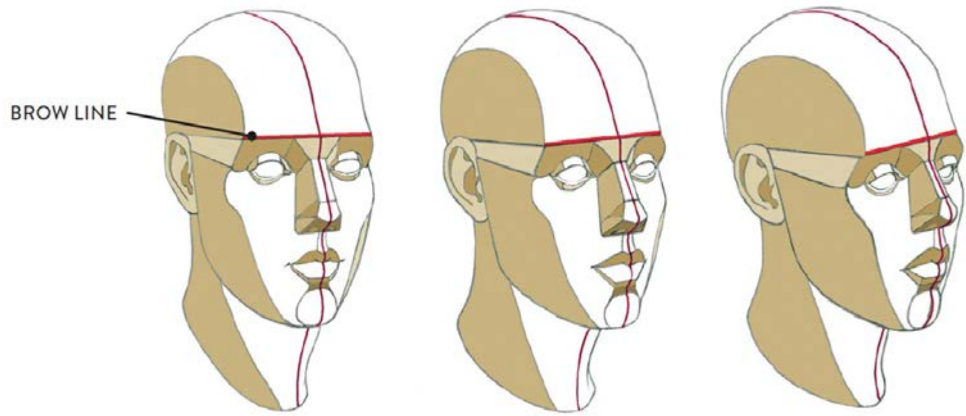
When you are practicing drawing the head from a live model, I suggest that you periodically position yourself at different levels above and below the model's eye level. If the model is sitting on a model stand and you are sitting lower down, you are observing the model from an *above-eye-level view* because the model's head is above

your own eye level. If you are standing at an easel and the model is sitting in a chair set on the floor (rather than on a model stand), your eye level will be higher than the model's—a *below-eye-level view.*

As when drawing any head, look for the placement of the head's midline, or central axis. This will tell you immediately if there is any rotation of the head. Then check the general placement of the eye line. Since the far eye can be partially hidden by the nose in extreme three-quarter views, check the direction of the brow line to determine your eye level in relation to the head you are observing. As the drawing below shows, the brow line will tilt upward in below-eye-level views but downward in above-eye-level views. Once this is established, position the shape of the nose on the midline and then place the rest of the features accordingly.

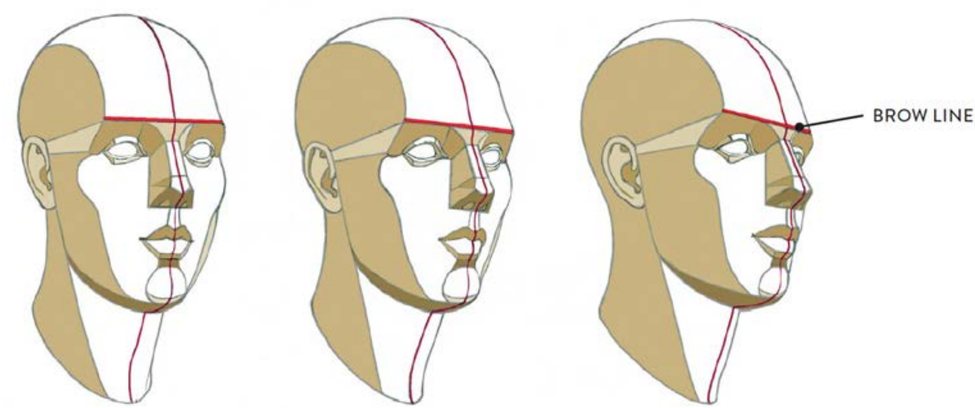
CHECKING YOUR EYE LEVEL

Observe the direction and alignment of the brow ridge (brow line) to determine your eye level.



Below-eye-level view

The head is positioned lower than your eye level. Brow line tilts upward as the head turns away from you.



Above-eye-level view

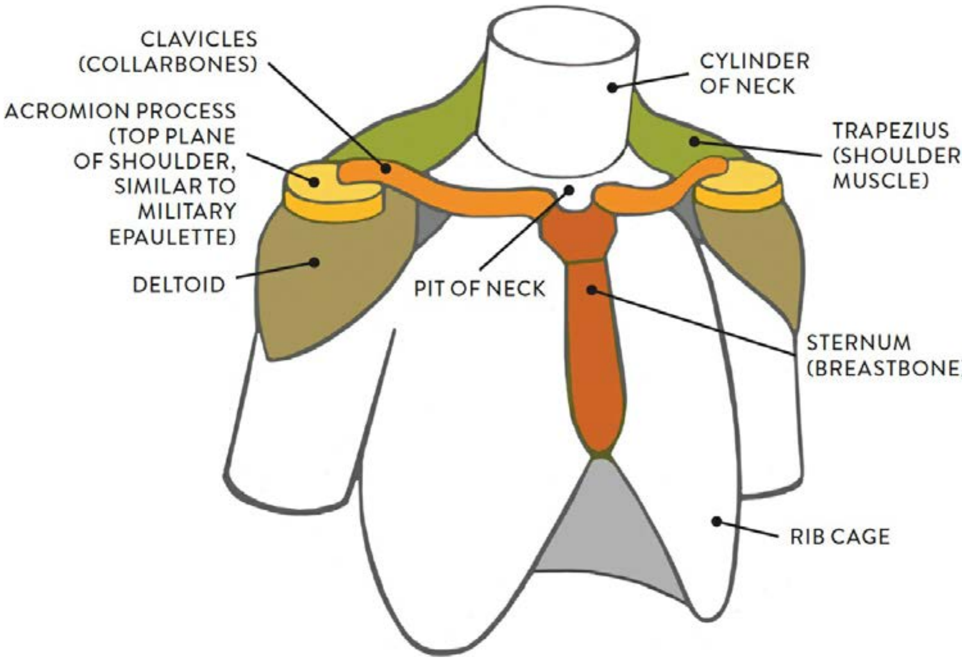
The head is positioned higher than your eye level. Brow line tilts downward as the head turns away from you.

Structures for the Neck and Shoulders

There are only a few basic forms on the neck and shoulder that you need to watch for when drawing a front or three-quarter view of the figure. The neck is basically a

cylinder emerging from the top of the rib cage structure. Check the position of the breastbone (sternum) to see if the rib cage is facing you directly or is slightly rotated away. Find the pit of the neck, which is the small depression between the inner ends of the collarbones. As you develop the drawing look for additional surface landmarks, such as the collarbones, the acromion process (the end of the spine of the scapula), and the trapezius and deltoid muscles. All these structures appear in the next drawing.

STRUCTURES OF NECK AND SHOULDERS

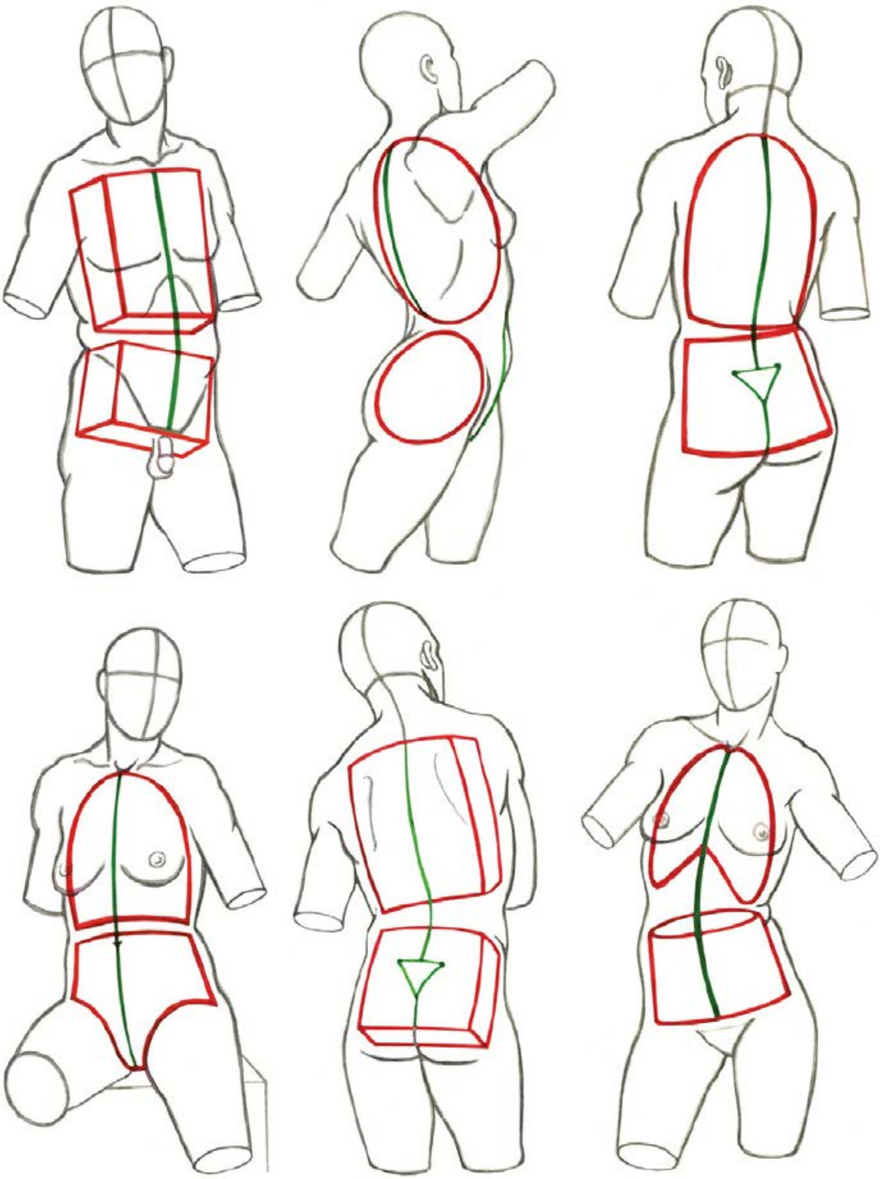


Three-quarter view

Structures for the Rib Cage and Pelvis

In most poses you will be able to sense the rib cage shape easily. The rib cage structure is similar to that of a vintage birdcage, but many artists indicate it very simply, using an egg or oval shape, with the breastbone (sternum) indicating the midline in front views and the vertebral column indicating the midline in back views. If you are able to see the rib cage arch on the model, it can also be lightly added. If the model is tilting toward or away from you, use a three-dimensional structure such as a cylinder or block shape when setting up the torso.

RIB CAGE AND PELVIS STRUCTURES



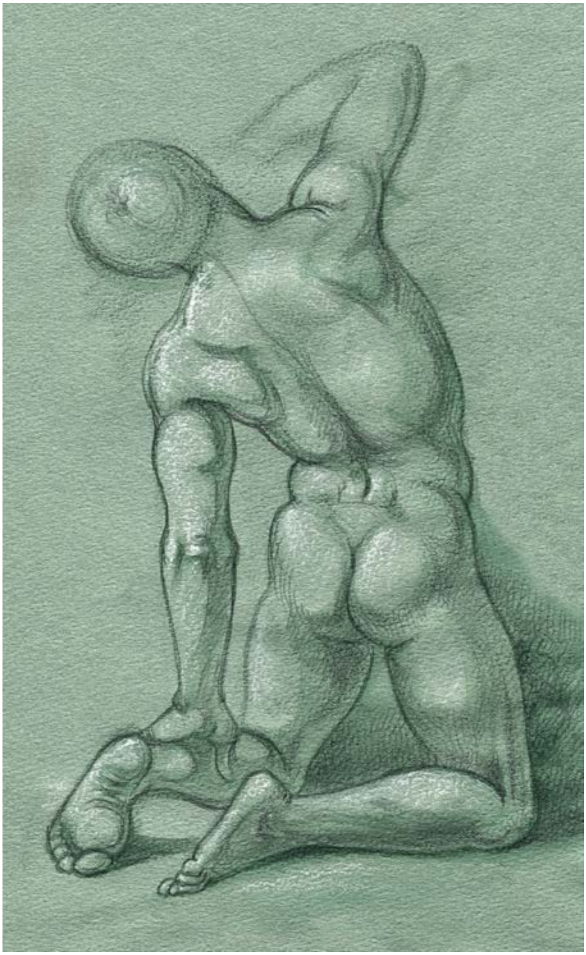
Shapes for blocking in the rib cage include oval, block, birdcage, and skeletal rib cage shapes. Pelvis shapes include blocks, wedges, ovals, and shapes that look like pants.

As we've seen, the pelvis bone is hard to locate on the figure because it is mostly

covered with soft-tissue forms. The only evidences we see are the triangular bone of the sacrum, on back views; the top ridge of the pelvis (iliac crest), on side views; and the two small bony bumps, each called an ASIS, on front and three-quarter views. These forms may be easy to detect in some poses but not in others. Sometimes strong light or shadow will eradicate any indication of these small landmarks. With scant visual evidence of the pelvis on the body's surface, many artists use a block shape (*pelvic block* or *pelvis box*), a wedge shape, or a pants-shaped form. Oval shapes work well for side views of the hip. You may want to use variations of these shapes depending on what is occurring in the pose and how the legs are positioned as they anchor into the pelvis shape. Combinations of the various shapes are shown in the drawing at left.

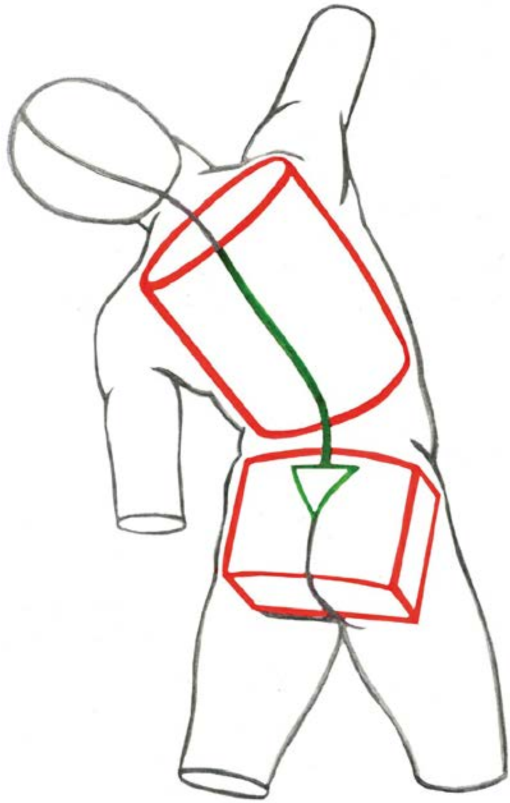
The life study *Kneeling Male Figure Leaning to One Side,* shows a figure bending toward the left and slightly backward. The accompanying structural diagram shows one possible way of establishing the basic structure of the torso in this pose.

KNEELING MALE FIGURE LEANING TO ONE SIDE



Dark green watercolor pencil, ballpoint pen, and white chalk on toned paper.

STRUCTURAL DIAGRAM



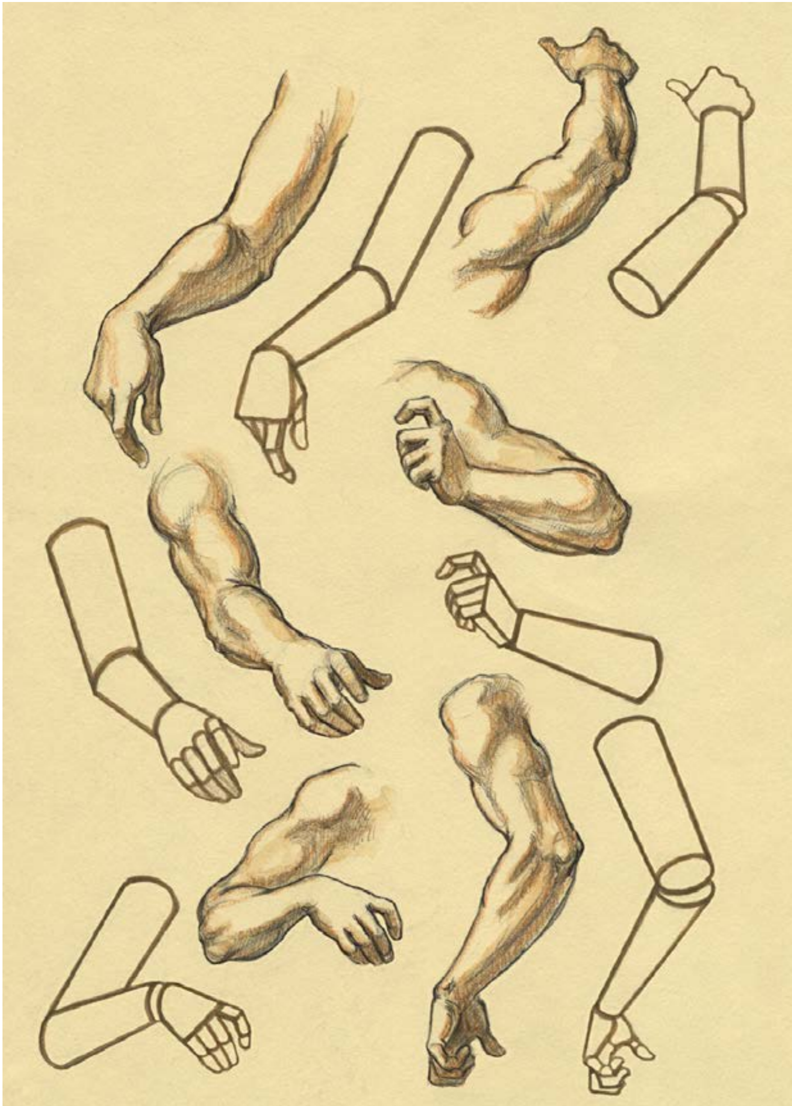
RIB CAGE: Red cylinder shape
PELVIS: Red block shape
CENTRAL AXIS OF TORSO: Green line

Structures for the Arm

Indicating structures for the arms is rather easy—elongated rectangles or cylindrical shapes work well in most poses. When drawing action poses, however, some artists use single lines (called *lines of action*) to represent the midlines of the upper and lower arms (see this page). When blocking in the structure of the arms, consider how they are placed spatially and whether there is any foreshortening in the view. If an arm is advancing toward you, then this should be indicated by the structure you establish—a

foreshortened cylinder. If there is no receding or advancing foreshortening of the arm, you can use simple flat, elongated rectangle shapes.

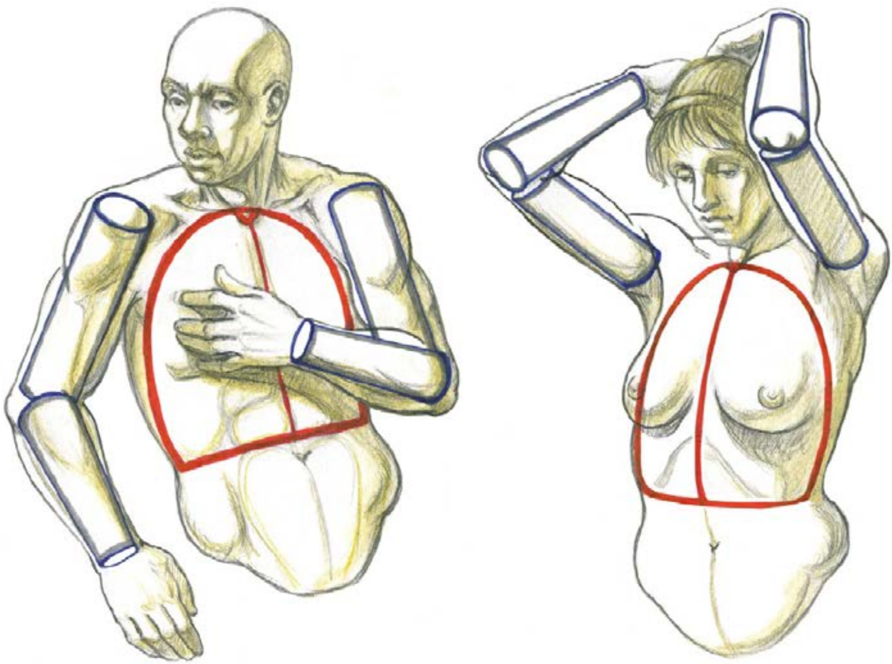
The following sketchbook studies are based on the arms of some of Michelangelo's figures in the Sistine Chapel frescoes—a treasure trove for studying the human form. This kind of exercise can, of course, be done using figures from any realistic figurative painting, sculpture, or photograph.



Graphite pencil, watercolor pencil, and brush-pen on light toned paper.

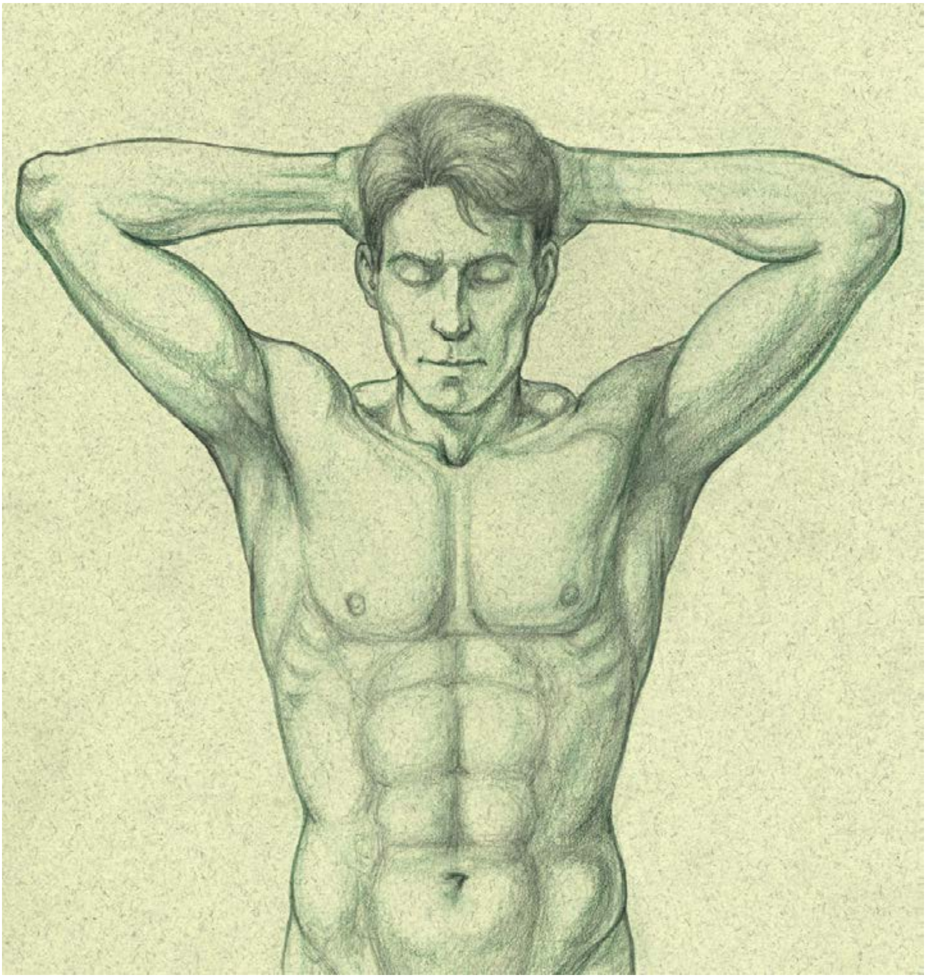
To position the arms in relation to the torso, think of the torso as a manikin with arm holes to which the cylindrical structures of the upper arms can be attached (see the structural diagram *Sketchbook Study of Female Figure with Arms Akimbo*). Or simply

indicate the upper arms as cylinders and the torso as a birdcage shape; as you add anatomical forms on top of these structures, the space between the rib cage and upper arm fills in with form. *Structures of the Arms and Rib cage—Two Studies,* on following page, shows the structural shapes of rib cages and arms superimposed on finished drawings.



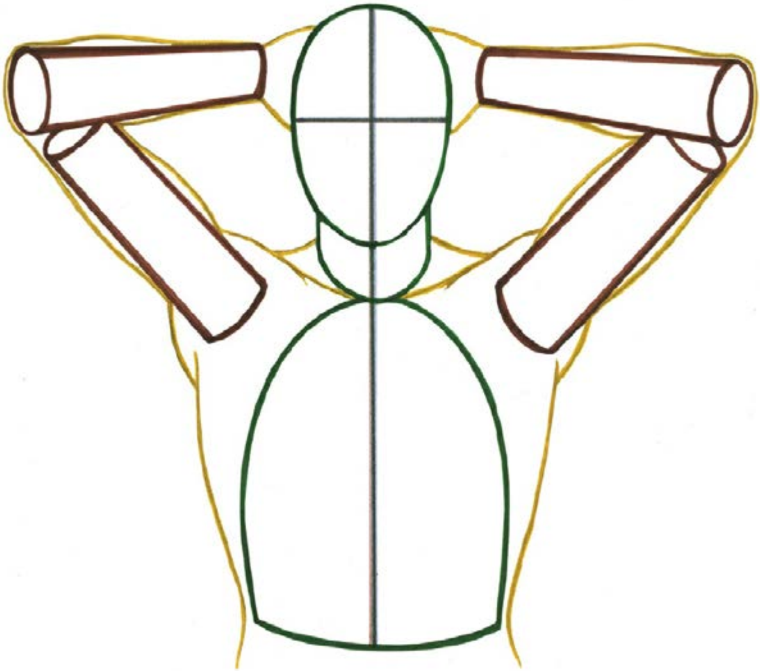
In the life study *Male Figure with Hands Clasped behind Head,* the figure faces toward us with arms held upward and hands clasped behind his head. Again, elongated cylinders were used as the basic structural shapes, as seen in the accompanying structural diagram.

MALE FIGURE WITH HANDS CLASPED BEHIND HEAD



Graphite pencil and colored pencil on light toned paper.

STRUCTURAL DIAGRAM



DARK BROWN LINES: Arm structures
GREEN LINES: Rib cage, neck, and head structures
GRAY LINES: Midline and eye line
DARK YELLOW LINES: Muscle contour

Arms Akimbo

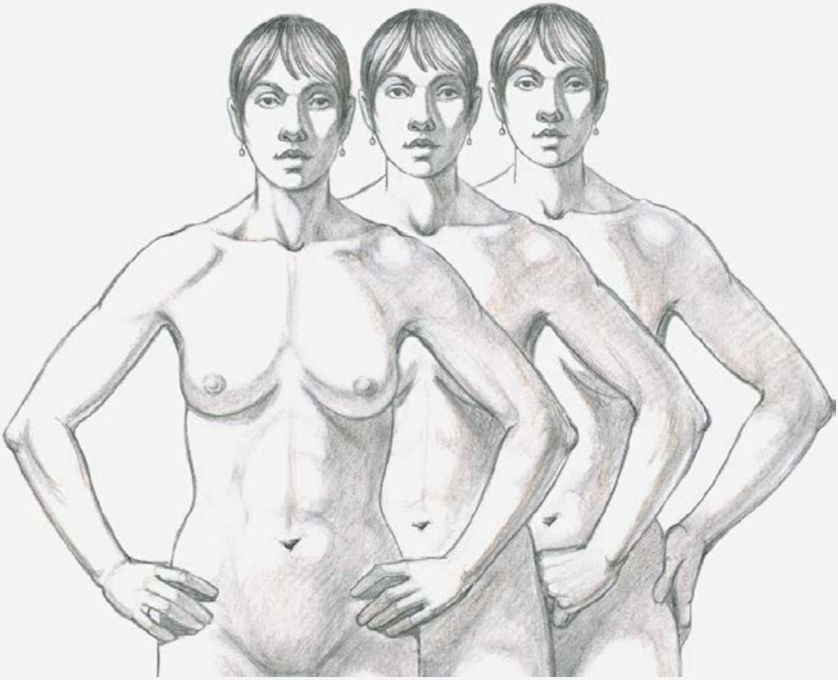
The phrase *arms akimbo* describes a pose in which both hands are placed on the hips. The upper arm and lower arm are bent, with the elbows pointing outward away from the torso. The hand can be placed on the hip in several different ways:

- With the palm downward and the fingers on the front of the torso while the thumb is positioned toward the back
- With the knuckles resting on the hip and the thumb folded against the index finger in a relaxed or tightly clenched way

- With the palm resting against the hip and the thumb positioned on the front while the fingers face toward the back
- With both the fingers and thumb at front while the palm rests on the hip

Some of these positions are shown in the drawing at left. Note that in such a pose, the hands can be positioned in the same way or in different ways.

ARMS AKIMBO—THREE POSITIONS



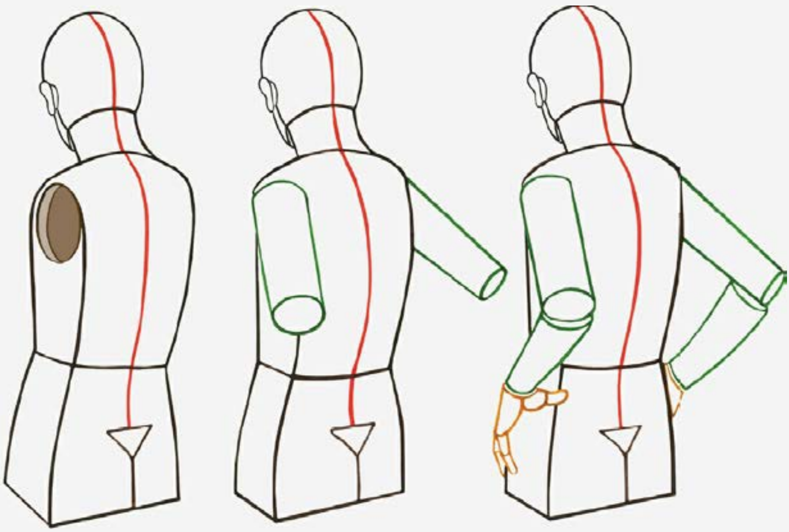
In the figure at left, the fingers are toward the front, with the thumb positioned toward the back. In the middle figure, the knuckles rest on the hips. In the figure at right, the thumb is positioned in front with fingers facing toward the back.

Sketchbook Study of Female Figure with Arms Akimbo, below, shows a woman resting her hands on her hips as seen from a posterior three-quarter view. When deciding how to structure the arms' attachment into the rib cage, it is helpful to think of the torso as a manikin whose parts are joined together. In the accompanying structural diagram, you can see the arm-hole on the torso of the manikin at the left. In the middle, the upper arms have been attached, and the lower arms and hands have been attached on the manikin at the right.

SKETCHBOOK STUDY OF FEMALE FIGURE WITH ARMS AKIMBO

Graphite pencil, ballpoint pen, watercolor pencil, and white chalk on paper.

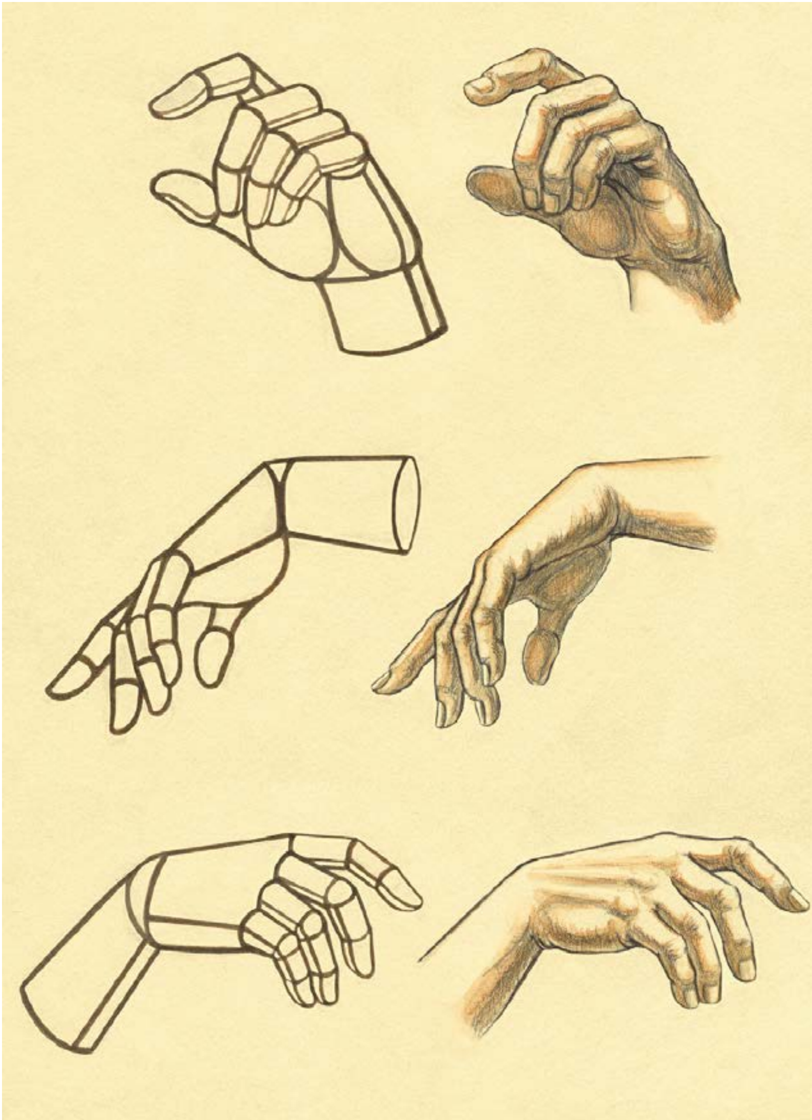
STRUCTURAL DIAGRAM—MANIKIN



RED LINES: Midline of torso
GREEN LINES: Arm structures
YELLOW LINES: Hand structures

Structures for the Hand

The armature for a hand study establishes how the hand is positioned spatially and helps you figure out the foreshortened elements, which occur in many views of the hand. If there is not too much foreshortening, then a block shape works well for the basic shape of the hand from the wrist to the base of the fingers. If your view is of the palm side, you may want to add shapes for the large, rounded thenar prominence (of the thumb) and the hypothenar eminence positioned below the little finger. Elongated blocks or cylinders work well as structural shapes for the fingers. The studies in the drawings above show just a few of the many combinations of shapes that may be used when constructing hands.

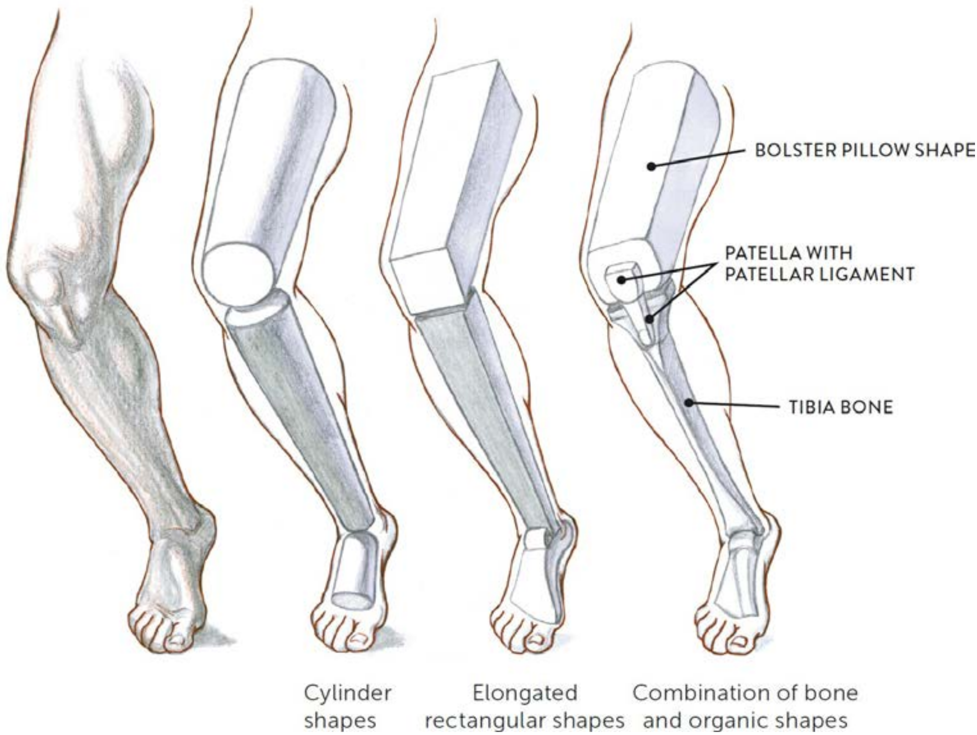


Graphite pencil, ballpoint pen, watercolor pencil, and brush-pen on light toned paper.

Graphite pencil, ballpoint pen, watercolor pencil, and brush-pen on light toned paper.

Structures for the Leg

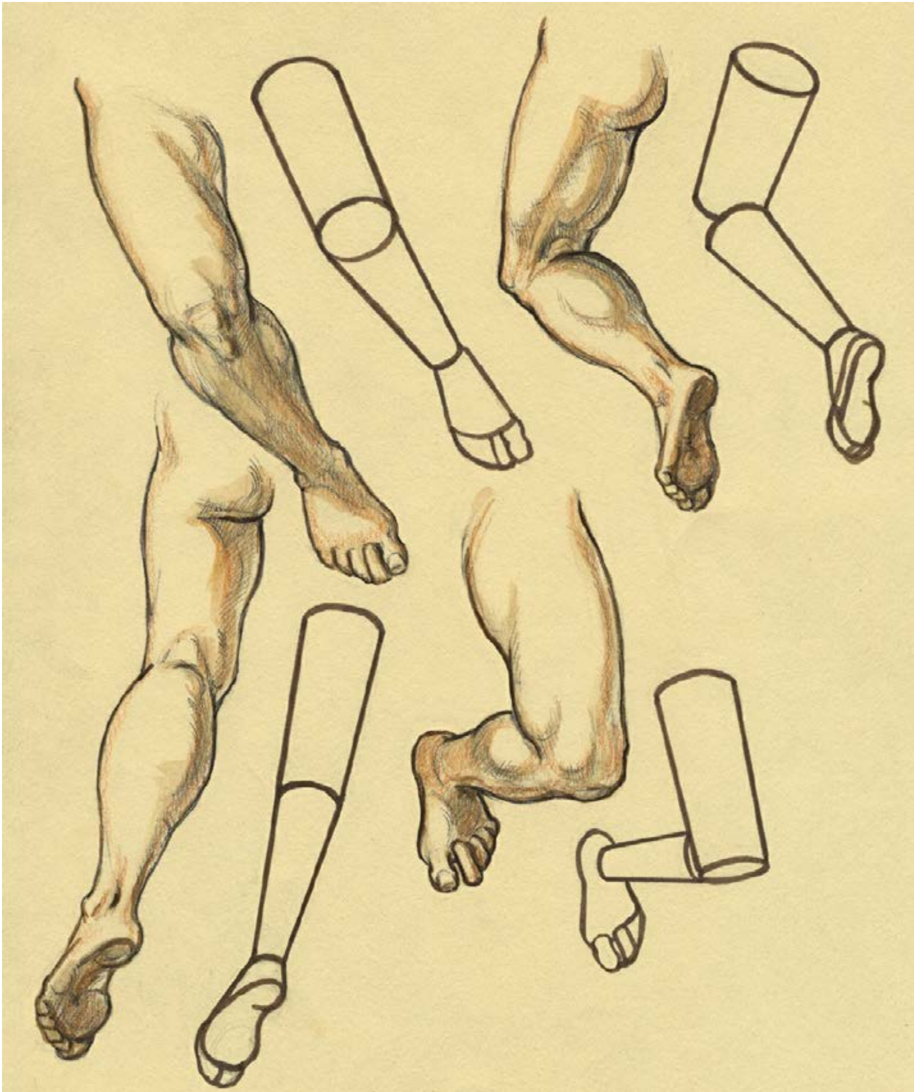
When blocking in the legs, use very simple shapes: cylinders or elongated rectangles. For example, for a bent-leg pose in which the upper leg and knee region are advancing toward you while the lower leg is tucked under and receding away, using cylinders or elongated blocks will immediately indicate the general volume of the upper leg and lower leg and how they are positioned spatially. There can, of course, be endless variations on a bent-leg pose in which you must also convey the tilt or angle of the upper leg and lower leg as well as the way in which the upper leg is anchored in the pelvis unit. You may also use organic shapes, simplified bone shapes, or a combination of organic and geometric shapes when structuring the leg. Since poses vary so greatly, try various structures to see which shape or combination works best for each study. Several approaches are shown in the following drawing.



Three-quarter view of a bent leg

The following sketchbook studies, are based on the legs of some of Michelangelo's figures in the Sistine Chapel frescoes. As I said in the section on structures of the arm, you may use any realistic figurative art as the basis for such studies.

SKETCHBOOK STUDIES OF LEGS FROM MICHELANGELO'S SISTINE CHAPEL FIGURES



Graphite pencil, watercolor pencil, and brush-pen on light toned paper.

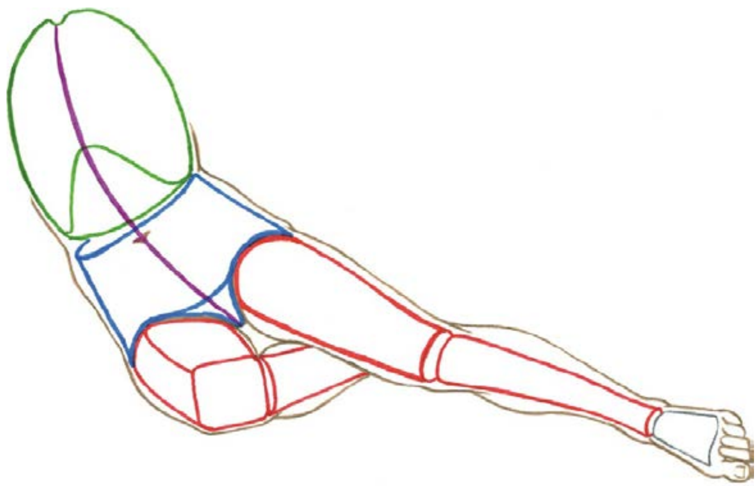
In the life study *Female Figure in a Sitting Pose on the Floor,* one of the model's legs is slightly foreshortened while the other is stretched out. The accompanying structural diagram shows how a pants shape was used to help connect the upper legs into the pelvis structure. Because of the foreshortening of the right upper leg, a foreshortened

block shape was used for that structure. Anatomical forms were added once all the structures of the torso and legs were established. The shadows on and around all the parts of the body that are touching the floor give weight to the figure, grounding it and preventing it from looking as if it were floating in midair.

FEMALE FIGURE IN A SITTING POSE ON THE FLOOR

Graphite pencil, ballpoint pen, watercolor pencils, and white chalk on tan toned paper.

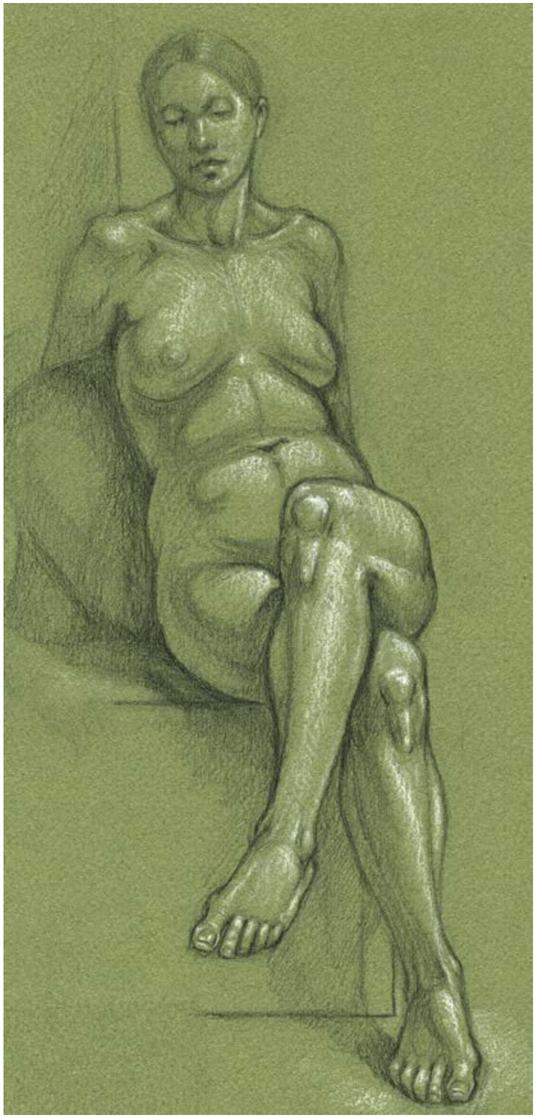
STRUCTURAL DIAGRAM



GREEN LINES: Structure of rib cage
BLUE LINES: Structural shape for pelvis
RED LINES: Structural rectangle and cylinder shapes for legs
PURPLE LINE: Central axis of torso

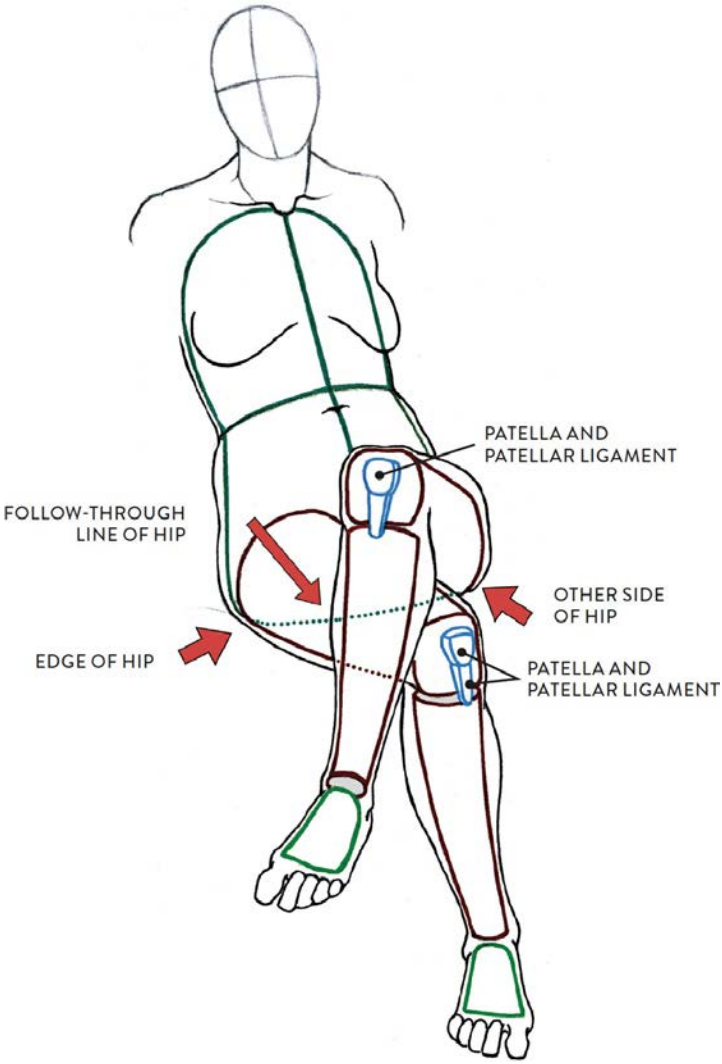
The life study *Female Figure Sitting with Legs Crossed,* shows a figure facing forward with one leg crossed over the other. The structural diagram shows the cylindrical shapes of the legs as they attach into the pelvis/hip. When drawing poses such as this, find the place where the hip ends—that is, the spot where the figure is actually sitting—and link up that side of the hip to the other side. This linear connection—a *structural follow-through line*—helps you make sure that the hips are aligned with each other and that one side is not too high or too low.

FEMALE FIGURE SITTING WITH LEGS CROSSED



Graphite pencil and white chalk on toned paper.

STRUCTURAL DIAGRAM

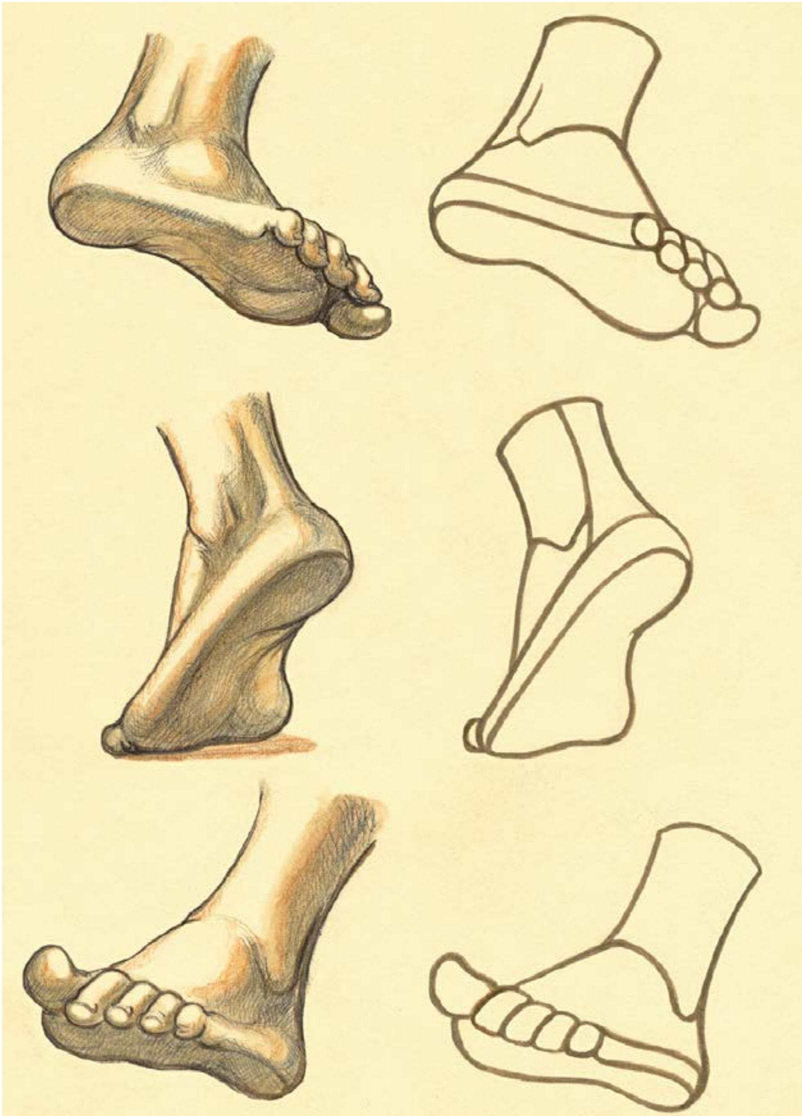


DARK BROWN LINES: Structural cylinders for the legs
BLUE LINES: Patella and patellar ligament
GREEN LINES: Torso structural shapes
RED ARROWS: Edges of hip

Structures for the Foot

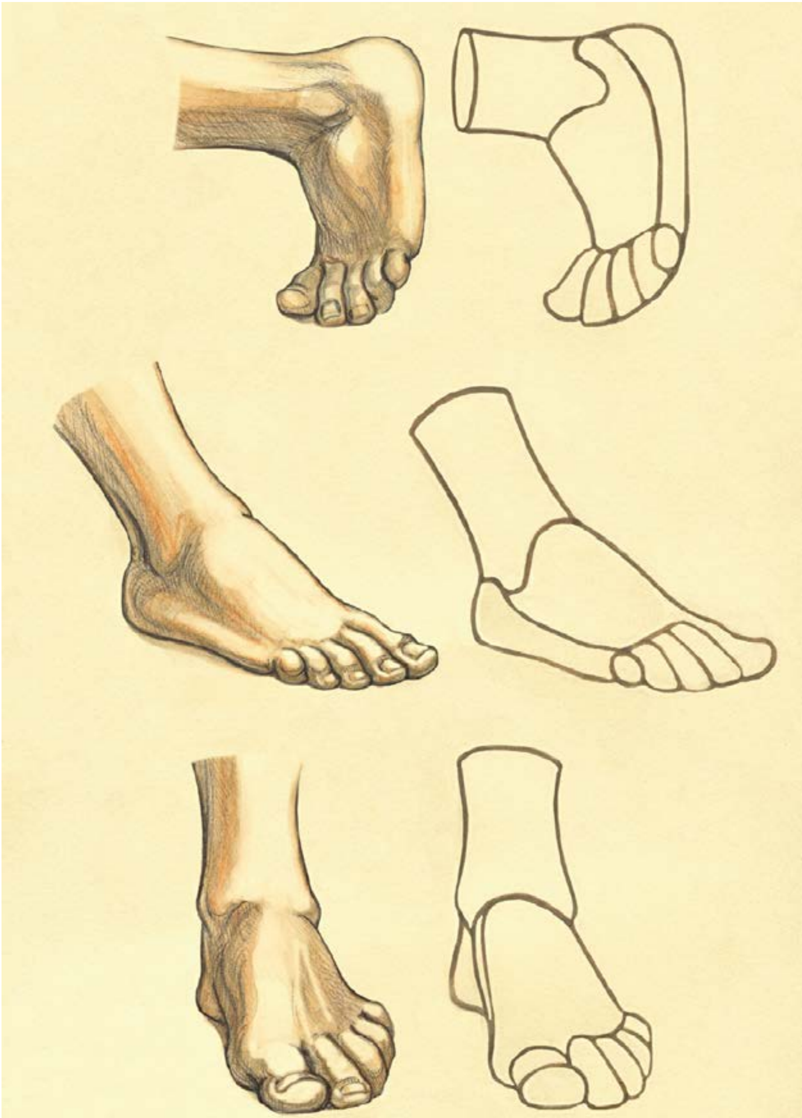
Feet are challenging to draw, paint, or sculpt because they take on so many different shapes in different poses. The shapes you choose when blocking in the foot therefore depend on the foot's position. Elongated triangles work well for side views, wedge shapes for front views, "bootie" or sock shapes for three-quarter views, and footprint shapes for views of the sole. Once your structural shape has been lightly depicted, add the anatomical forms you see in that particular view. The sets of studies in the drawings below show just a few of the many possibilities.

LIFE STUDIES OF FEET #1



Graphite pencil, ballpoint pen, watercolor pencil, and brush-pen on light toned paper.

LIFE STUDIES OF FEET #2



Graphite pencil, ballpoint pen, watercolor pencil, and brush-pen on light toned paper.

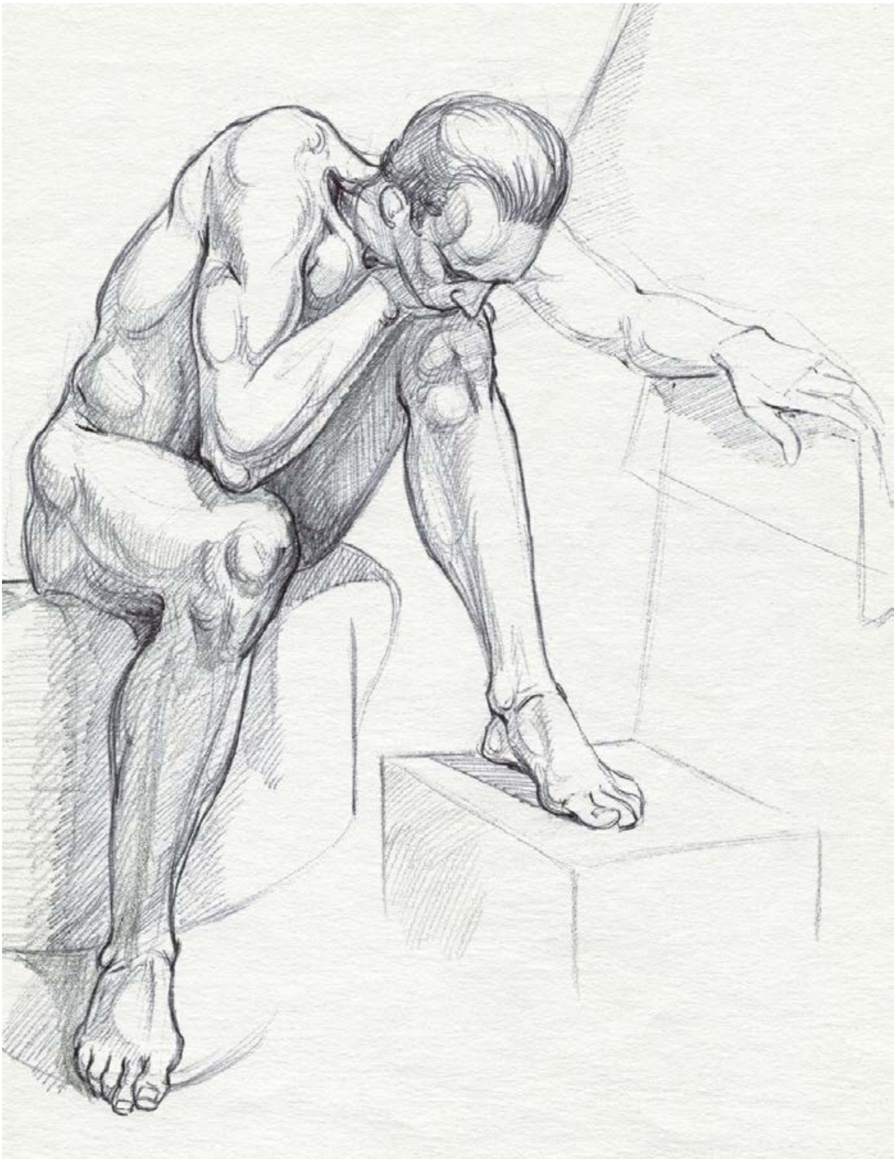
The Planes of the Figure

From the Renaissance to modern times, a number of artists have used the planes of the figure as a way to study the human body. Examples of such work include the pen-and-ink figure studies of Michelangelo (Italian, 1475–1564), the manikin figure studies of Luca Cambiaso (Italian, 1527–1585), and the anatomical drawings of George Bridgman (Canadian-American, 1865–1943).

Indicating the plane changes on the surface of the figure can give a three-dimensional quality to the forms. The approach is simple: Break the surfaces of body parts into four fundamental planes: *top, front, side,* and *bottom.* Examples of each of these planes are given in the sidebar on this page.

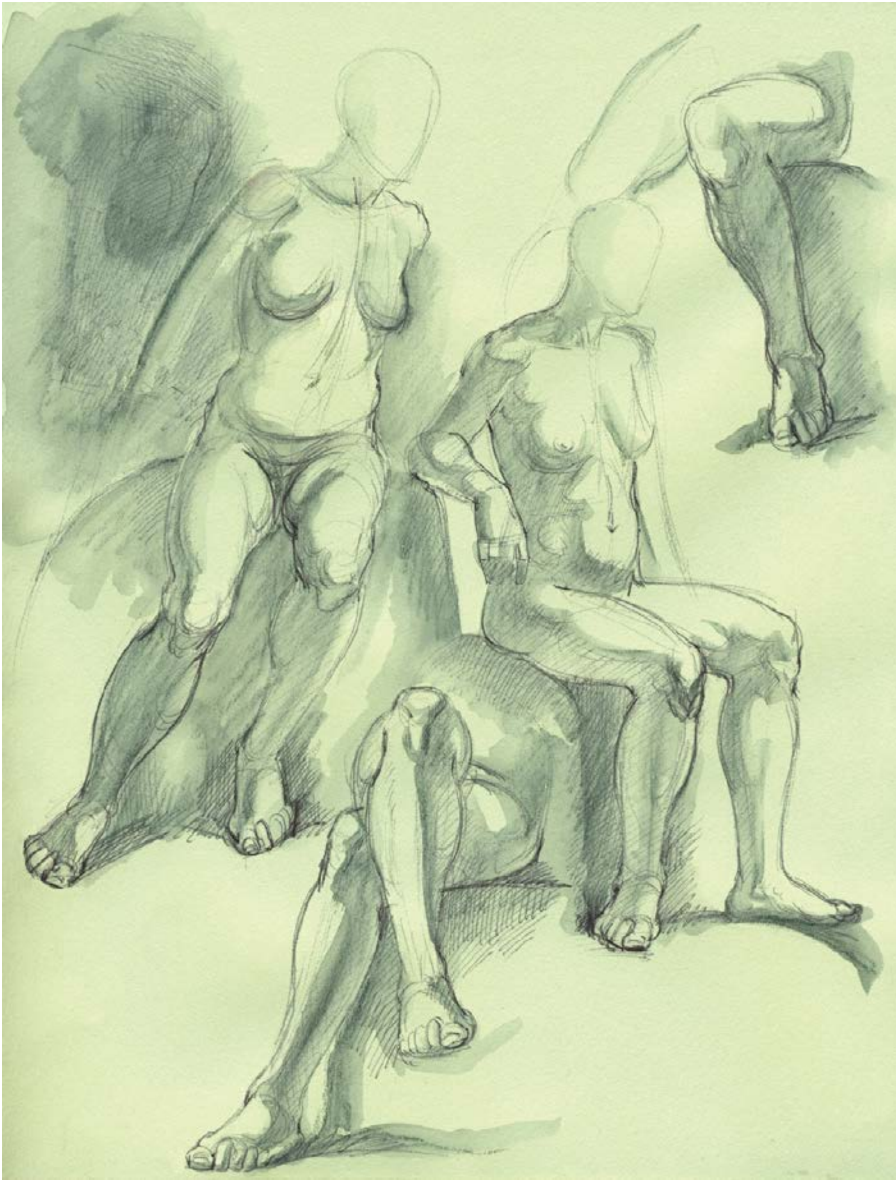
When breaking the body into planes, you can indicate the surface changes with line work (e.g., cross-hatching), or you can apply tones of differing values to create the illusion of three-dimensional forms. In *Study of a Sitting Male Figure Leaning Over,* the planes are indicated with hatching and cross-hatching. In *Studies of Torsos and Legs,* diluted ink washes of darker and lighter values were applied to indicate the planes of the figures and the environment.

STUDY OF A SITTING MALE FIGURE LEANING OVER



Ballpoint pen with traces of graphite pencil on white paper.

STUDIES OF TORSOS AND LEGS



Ballpoint pen and ink wash on light toned paper.

Directions of Body Planes

Directions of Body Planes

Body planes face in four basic directions: top, front, side, and bottom. The direction may change depending on the pose. For example, in an anterior view of a standing pose, the front of the torso is a front plane, but when the model reclines on his or her back, the front of the torso becomes a top plane.

The *top plane* is usually the uppermost region of a form. In an ordinary standing or sitting pose, top planes would include the top region of the head (easier to see on a head without hair), the top portion of the shoulders (trapezius muscles), and the top (dorsal side) of the foot. If the model is sitting or is raising the thigh at the hip joint, the top of the thigh would be a top plane.

A *front plane* is an area facing the viewer. The front planes of a body change depending on whether you are observing it from an anterior (front), lateral (side), or posterior (back) view. For example, in a straightforward anterior view of a standing pose, the forehead, front portions of the face (upper cheeks, philtrum, lower lip, chin), front portions of the front of the torso, and the front of the entire leg would be front planes. In a posterior view, however, the portions of the back of the torso that are facing you would be front planes.

Side planes are the parts of the form that are turning away from a front plane. For example, in an anterior view, the sides of the head, which turn away from the forehead at the edges of the temple lines, would be side planes.

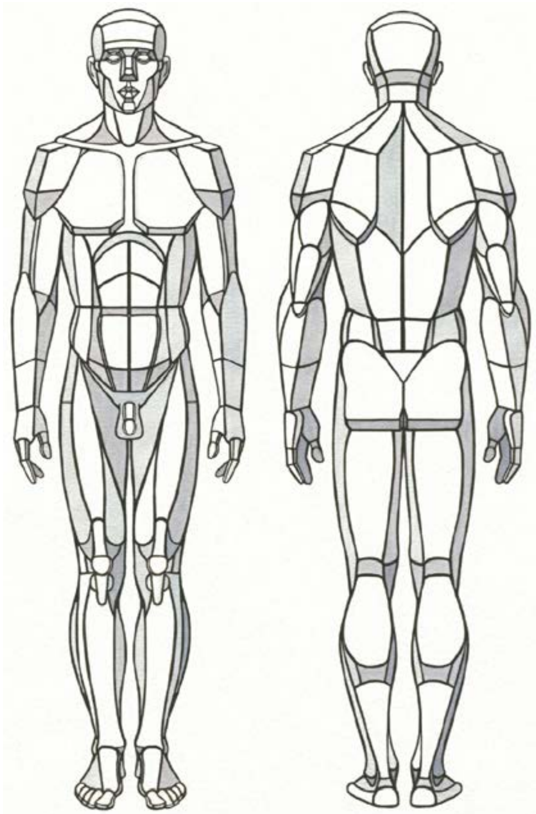
Bottom planes are often neglected by artists, but they are very important. Indicating these planes helps create the illusion that the forms are projecting or receding in space. For example, in an ordinary anterior view, bottom planes would include the bottom plane of the nose (where the nostrils are), the upper lip, the bottom plane of the jaw (the transition between the edge of the lower jaw and the cylinder of the neck), the planes beneath prominent cheekbones, and the bottom planes of the chest forms. In a posterior view, they would include the bottom planes of the buttocks.

The *edges of planes* are transitions from one plane to an adjacent plane. You can render them as soft and subtle, pronounced, or even somewhat sharp in appearance.

By the way, just in case you're wondering why there is no "back plane" on the list above, the reason is simple: The back plane of a body part is always hidden from an observer's view.

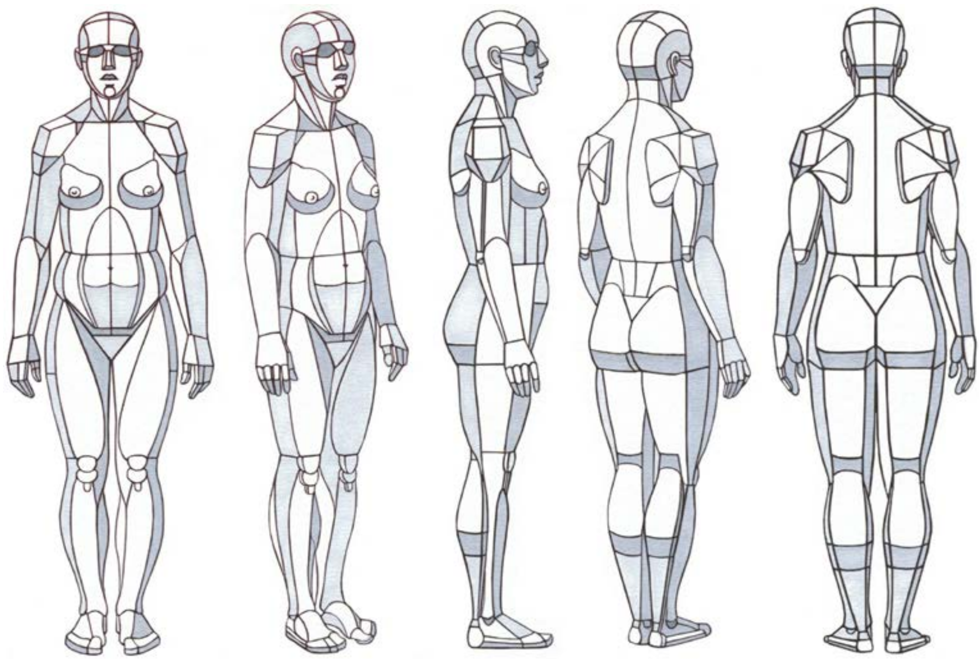
When you apply planes to a drawing, you're working much like a sculptor who first carves the basic planes out of a piece of marble or shapes them with clay before refining the transitions between anatomical forms. Depending on how you want to treat the surface form, planes can be simple or complex, small or large, flat or curved, angular or round, convex or concave. There can be numerous combinations of planes within one area of the body, as you can see from the drawings on this page, which show rather complex breakdowns of the many surface planes of an athletic male body and a full-figured female body, as well as in the drawings of the planes of the hand and foot.

PLANES OF AN ATHLETIC MALE BODY



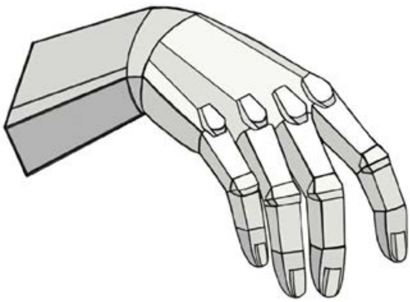
Anterior (left) and posterior (right) views

PLANES OF A FULL-FIGURED FEMALE BODY



Anterior view   Anterior three-quarter view   Lateral view   Posterior three-quarter view   Posterior view

PLANES OF THE HAND

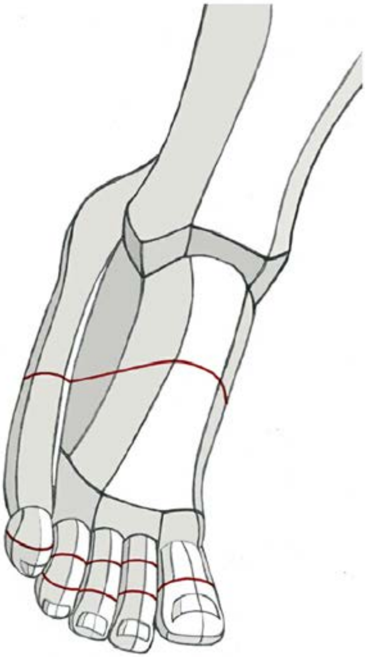


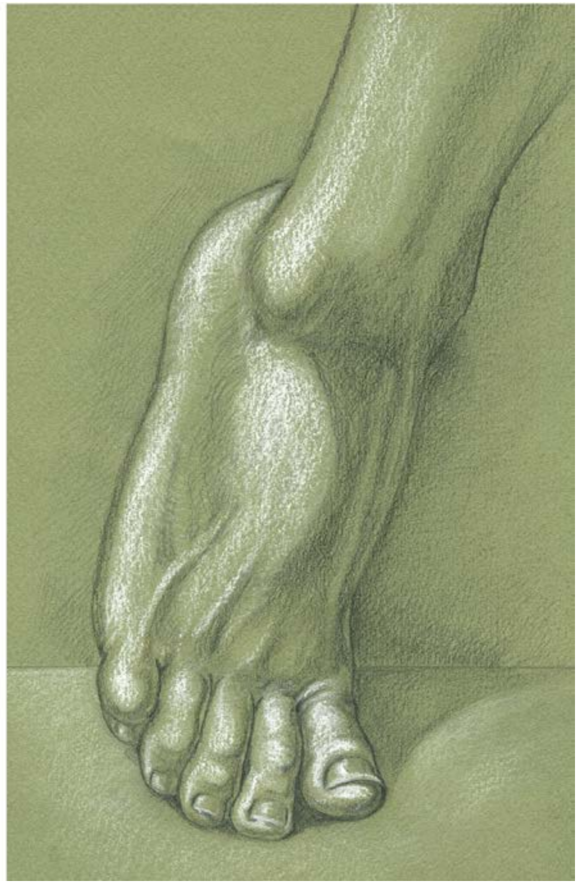
Graphite pencil, ballpoint pen, and watercolor pencils on white paper.

LEFT: Structural diagram

RIGHT: Study of a hand in a resting position

PLANES OF THE FOOT

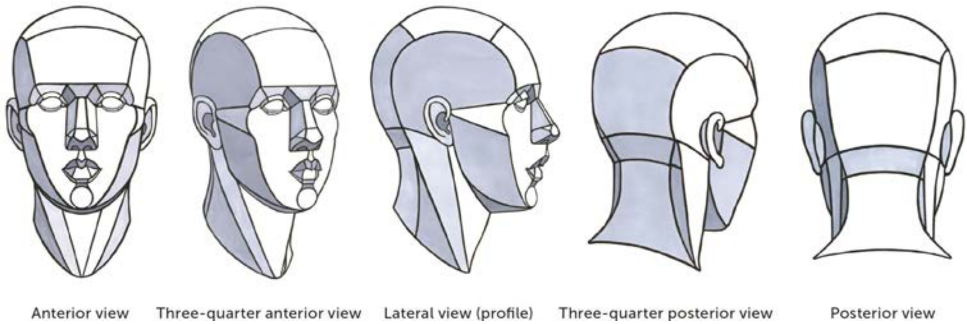




Graphite pencil and white chalk on toned paper.

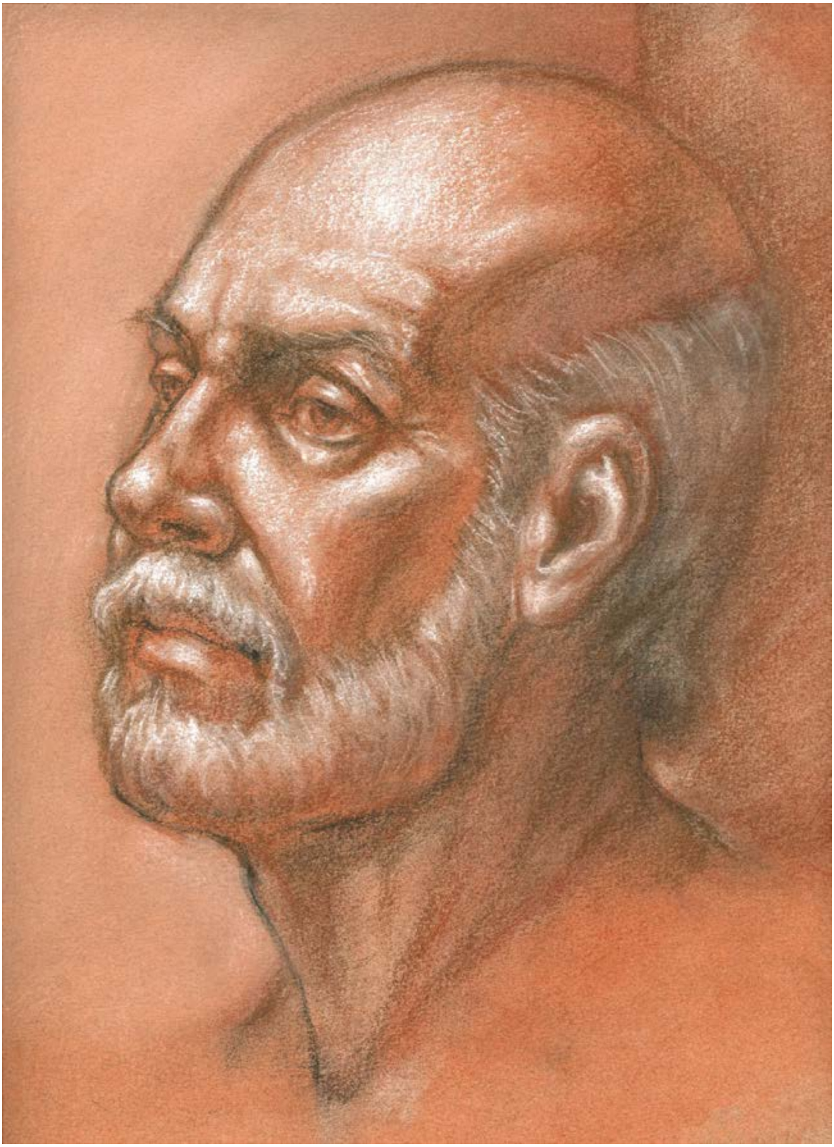
LEFT: Structural diagram

RIGHT: Study of a poised foot



The complexity of the planes of the face is of particular interest to many artists. There are just a few areas on the face where bony landmarks are evident: the jawline, cheekbones, bridge of the nose, and the brow line of the forehead. The soft tissues of the face give it an organic quality, without any sharp edges. However, it is possible to take a more geometric approach to depicting the face, giving sharper definition to corners and angles. This purposely modifies the forms into "chiseled" shapes, making it easier to see the transitions between the forms in an obvious, direct way. The drawing below shows the head conceived in this geometric way from five different views.

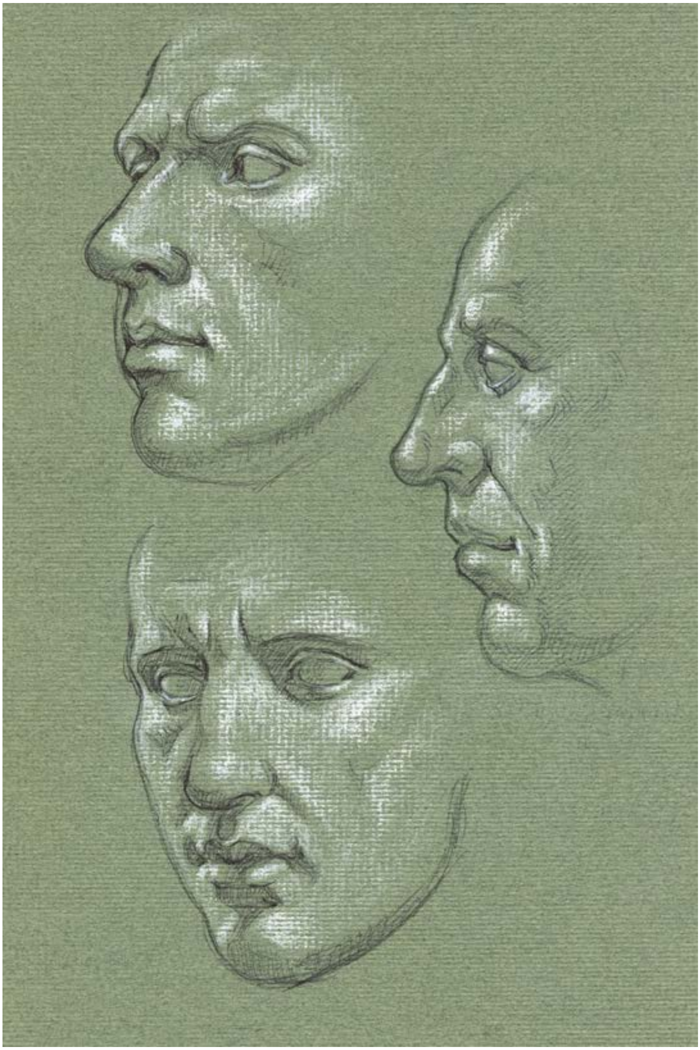
You can make use of the knowledge gained by breaking the head into its constituent planes when doing life studies. For example, the drawing *Study of a Bearded Man,* gains force and character through the many gradations indicating transitions between top, front, side, and bottom planes.



Black and sanguine Conté crayon and white chalk on toned paper prepared with sanguine pastel dust.

Doing studies based on sculptures is one way to practice drawing the planes of the head. For this purpose, sculptures made of marble or another kind of stone are better than bronze sculptures, because the planes are easier to see as a series of value changes.

Ancient Roman sculptors were particularly skilled at doing marble portraits that emphasize the planes of their subjects' faces. My *Sketchbook Studies of Roman Portraits,* is based on a few such sculpted heads. The white chalk used in these sketches highlights the basic front planes of the face.



Ballpoint pen and white chalk on toned paper.

TWO-MINUTE GESTURE DRAWING OF A FEMALE FIGURE, BACK VIEW

Black Conté crayon and brown pastel stick on white paper.

Chapter 10

Gesture and Action Drawing

One of the most exhilarating ways to study the human figure is to sketch the figure in a rapid fashion. This process is known by several names—*gesture drawing, action studies, warm-ups, quick studies,* and *croquis* (pron., crow-kee). While gesture drawing is only one of countless approaches to figure drawing, many artists consider it the most expressive and spontaneous. It's enormous fun to capture a pose in just a few seconds or minutes, with only a few strokes on the paper.

Gesture drawing also helps build and maintain skill. Figurative artists across disciplines find that doing gesture studies loosens them up, keeps them in shape artistically, and sometimes triggers artistic ideas. Drawing quickly from a model is a terrific way to improve your line quality and your ability to convey dynamic movement. Especially in the shorter poses, it can also help you "edit out" any inessential details. For an artist, gesture drawing is akin to an athlete, dancer, or musician's warming up before a performance. Just like athletes and performers, artists need to warm up regularly and practice often, preferably on a daily basis.

The best way to practice gesture drawing is to draw from a live model in a studio setting. It's electrifying to try to capture the dynamic quality of a pose before the model changes to the next pose. Although you can certainly practice from photographs, nothing beats the high-octane atmosphere produced by a live model creating unexpected and challenging poses on the spot.

Most figure drawing classes incorporate gesture drawing as an important exercise. Teachers know that students who have warmed up with gesture drawing will produce more focused and creative drawings during the rest of the class session. Likewise, in figure drawing workshops that are open to the public, models usually start out with briefer action poses before going into the longer poses.

GESTURE STUDY OF THREE FIGURES DANCING

Colored pencil on white paper.

If you can't get to a figure drawing class or workshop but want to practice from real people, sketching people in everyday situations—in museums, parks, shopping malls, cafés—can also be a great way to practice. People who are unaware that you are

drawing them tend to act in a more natural way than professional models, whose poses are more dramatic or calculated.

One of the best things about gesture drawing is that it makes you give up any expectation of doing a “perfect” drawing. The focus is on capturing the essence of a pose without getting bogged down in details, and gesture drawing temporarily frees you from concerns about proportions and anatomical accuracy and from trying to create the illusion of three-dimensional form. Artists need to know that it is okay to let go at times, slam-dunking a drawing without judging their own skills. Critical self-evaluation can often sabotage your drawings, so it’s good to get rid of preconceived notions of what a drawing should or should not be and just have a great time sketching your heart out.

Another block that artists sometimes suffer comes from feeling that they have to be in the “right mood” to draw, or that they have to wait until they feel inspired or motivated. But moods that interfere with your art need to be bulldozed, and one of the best ways to do this is to practice gesture drawings even if you are *not* feeling up for it. If you’re feeling bored or angry about something, channel the mood into the drawing without worrying about the outcome. Even doing a few sketchbook drawings a day can keep you from getting creatively blocked and help you stay connected with your art.

Gesture drawing can also be applied to drawing from memory or imagination. A doodle might turn into a torso, and before you know it, a figure will materialize from a few raw strokes. You can also visualize a pose in your mind and flesh it out rapidly on paper without worrying about accuracies of anatomy or proportion. Remember, these are meant to be enjoyable exercises. No one else ever has to see your gesture studies, so there’s no need to worry about what others may think of your drawing skill. On the other hand, if you feel comfortable doing so, you might share your sketchbook studies with artist friends. They will usually be very supportive. If not, then it might be time to get some new artist friends.

There are many ways to do gesture drawings, several of which are explored in this chapter. No one method is the “right” way. Artistic experimentation calls for a variety of techniques and tools, and having an open attitude toward different methods will increase your creative possibilities. Eventually, you will find your own favorite methods and tools for drawing gestures.

GESTURE STUDY OF A STANDING BACK VIEW

Black Conté crayon on newsprint.

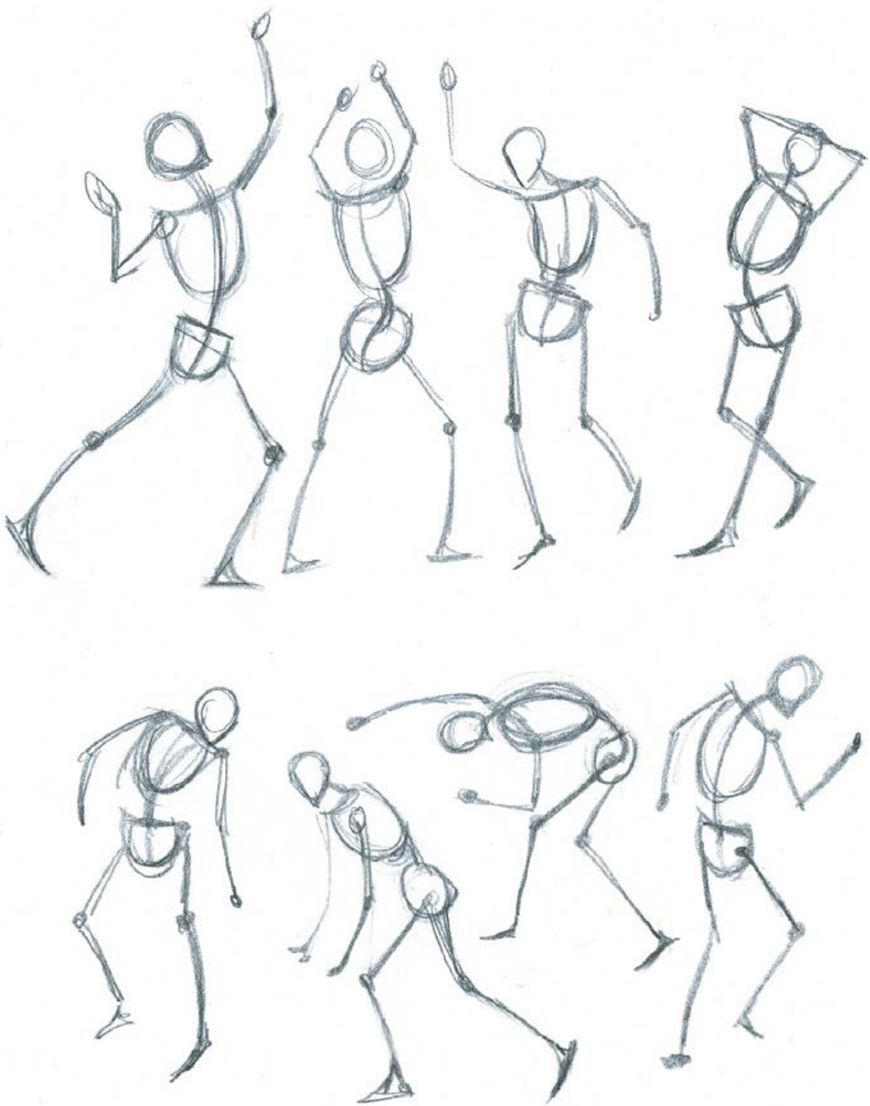
Method #1: The Stick Figure Approach

Poses of 15 to 30 seconds

People have been drawing stick figures ever since Paleolithic times, and most children instinctively use this approach when drawing people. For figurative artists who need to indicate the action of the whole figure in just a few seconds, this rudimentary method works well.

When drawing a pose very quickly, indicate the limbs, spinal column, hips, and shoulder angle as single lines, using simple circles or block shapes for the head, rib cage, and pelvis. Check the joints at the shoulders, elbows, hips, and knees to quickly show how the limbs are tilting in different directions within the pose. Even though this is an extremely primitive approach to drawing the figure, it can rapidly document an action pose.

Stick figure approach



Graphite pencil on white paper.

Method #2: The Silhouette Approach

Poses of 30 seconds to 1 minute

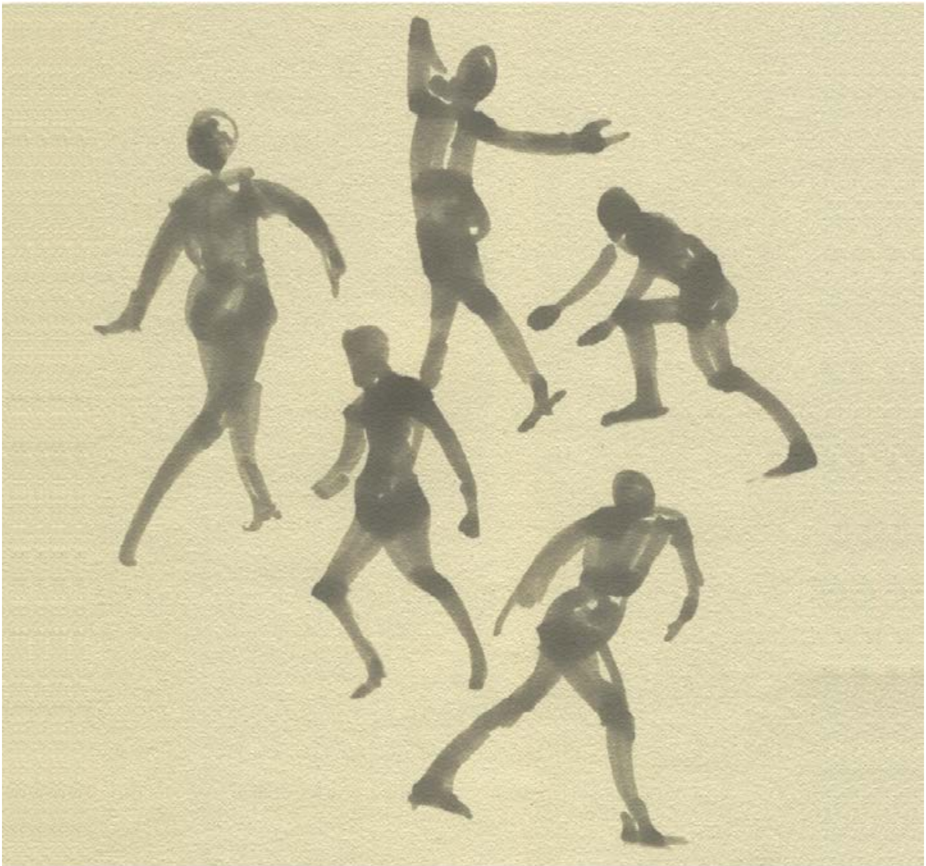
Another way of getting the whole pose on paper in a very limited amount of time is to draw the figure as a simple two-dimensional silhouette. When drawing the pure shape of the pose without any detail, you'll be aware of the tilts and angles of the body but will edit out any indication of three-dimensional form.

Broad-tipped drawing tools work well for this approach: chisel-tipped markers, brush-pens (pens with a soft, brushlike tip), vine charcoal sticks, pastel sticks, and broad graphite pencils are all good choices. Or you might use a brush loaded with ink or a diluted ink wash to capture the shapes of the figure in quick, broad strokes—or a chamois cloth dipped in pastel or charcoal dust.

A variation on this technique is to use pure, silhouetted shapes for some parts of the body while giving other parts a few highlights to give dimension to the forms. If you like, you might add a few lines once the basic shape is blocked in.

GESTURE STUDY OF FIVE FIGURES

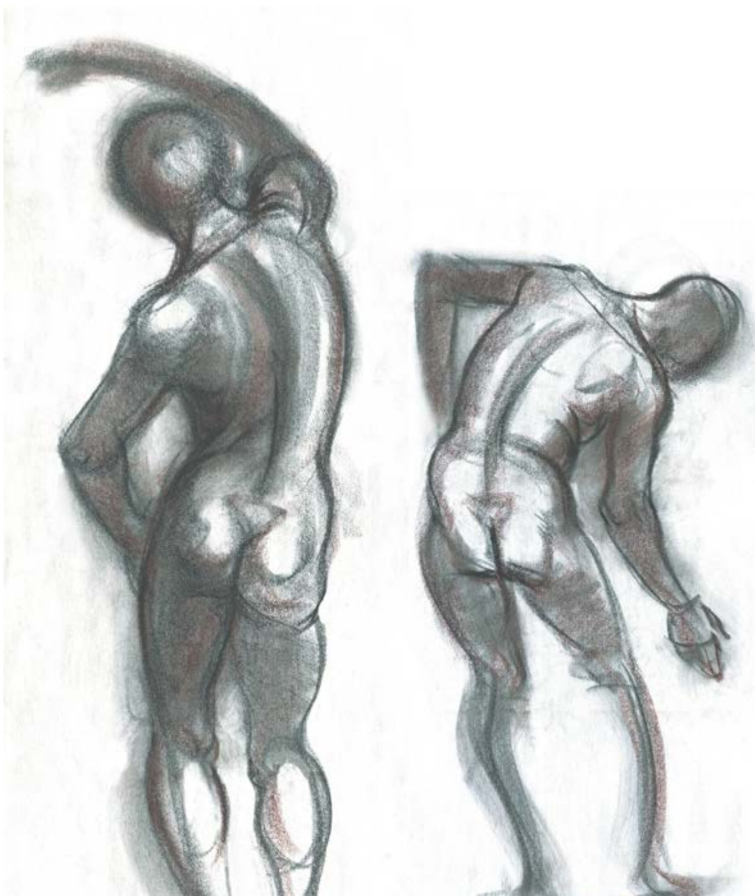
Silhoutte approach



Gray chisel-tipped marker on cream-colored paper.

GESTURE STUDY OF TWO DANCERS

Silhoutte approach, with lines added



Black Conté crayon and brown pastel stick on newsprint.

Method #3: The Searching Line Approach

Poses of 30 seconds to 1 minute

The “searching line” approach captures the pose with multiple lines. You may use a series of organic, swirling lines, barely lifting the drawing tool from the paper, or apply angular strokes in a bold, aggressive fashion to mark obvious directional angles and tilts. Or you can combine both kinds of lines in the same drawing, depending on the pose and how you want to capture the action. As the method’s name implies, you are *searching* for the gesture of the pose.

This way of working is spontaneous, so don’t worry about proportion or anatomical accuracy. There is no time to even consider such things. You are simply capturing the pose in its purest essence with vitality and energy.

The searching line method is practical for extremely fast studies, such as 30-second to 1-minute poses. You can use any drawing tool you like, but ballpoint pens, graphite pencils, mechanical pencils, and waxy colored pencils that maintain somewhat sharp points work well for this approach, as do fine-tipped markers and brush-pens.

When using this technique, first find the main action of the pose and then flesh out the shape of the figure with multiple flowing lines or agitated strokes. The strokes themselves should be executed rapidly, because the pose is not held for very long.

Most artists start with the head shape and then quickly indicate the torso, followed by the direction of the limbs. There is usually too little time to suggest smaller forms such as hands or feet, except perhaps with small, rapid strokes. At first glance, drawings done in this style may appear to be just a bunch of unrelated scribbles, but if you examine them more closely, you will see the pose emerging from the heap of organic lines. This is part of the magic of this approach. It is extremely organic and visceral, and a lot of fun. There are no rules. Just trust your intuition and let the lines jab or flow.

GESTURE STUDIES OF FOUR FIGURES

Searching line approach

Gray brush-pen on cream colored paper.

GESTURE STUDY OF TWO FIGURES

Searching line approach

Colored pencil on white paper.

Method #4: The Organic Line Approach

Poses of 1 to 2 minutes

In the organic line approach to gesture drawing, you lay down your lines in a flowing, loose manner, but more selectively than in the searching line approach. If you wish, you can use different values (light and dark lines) to accentuate the rhythm of forms, to convey tension, or to show that forms are advancing or receding—though in a highly edited way. Very often, the lines in an organic-line gesture drawing have a calligraphic quality, changing from thick to thin or dark to light in a single stroke. You can also add tones to your drawing. Charcoal, Conté crayons, graphite pencils, and colored pencils are all suitable for this approach, as are calligraphy pens that can produce both thick and thin strokes.

The organic line approach is great for relatively short poses—1 to 2 minutes. When doing an organic line study, look for any interesting tilting or twisting action within the pose that you can exaggerate to create greater dynamic tension. You may emphasize certain anatomical forms, but draw them rapidly because of the time constraint.

GESTURE DRAWING OF A FIGURE IN A CONTRAPPOSTO POSE

Organic line approach

Black crayon on newsprint.

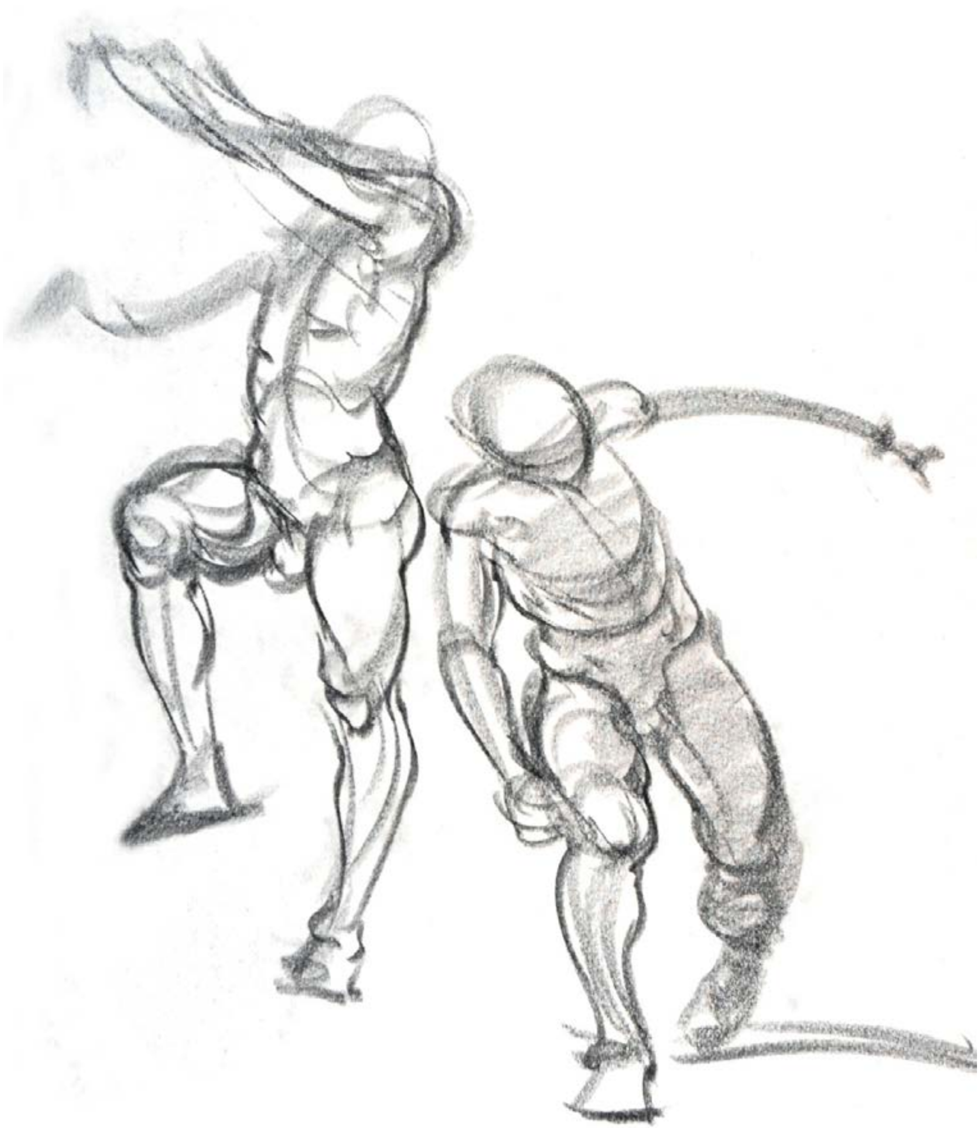
GESTURE STUDY OF TWO MALE FIGURES IN DANCE POSES

Organic line approach

Black Conté crayon on newsprint.

2-MINUTE STUDIES OF ACTION POSES

Organic line approach



Black Conté crayon on newsprint.

Method #5: The Contour Lines and Tones Approach

Poses of 3 to 5 minutes

This approach is similar to the organic line approach, but it allows you to use additional tones. The lines can be applied with a graphite pencil, charcoal, or colored pencils that are kept sharpened (see sidebar). As with the organic line approach, your lines can vary in width, giving a calligraphic quality to certain parts of the drawing. Your contour lines can capture the figure's anatomical forms—but, again, in a very selective, edited way. You can apply tones with the same tool you use for the line work, or you can dip a chamois cloth in charcoal or pastel dust and lightly smear the tones on the drawing.

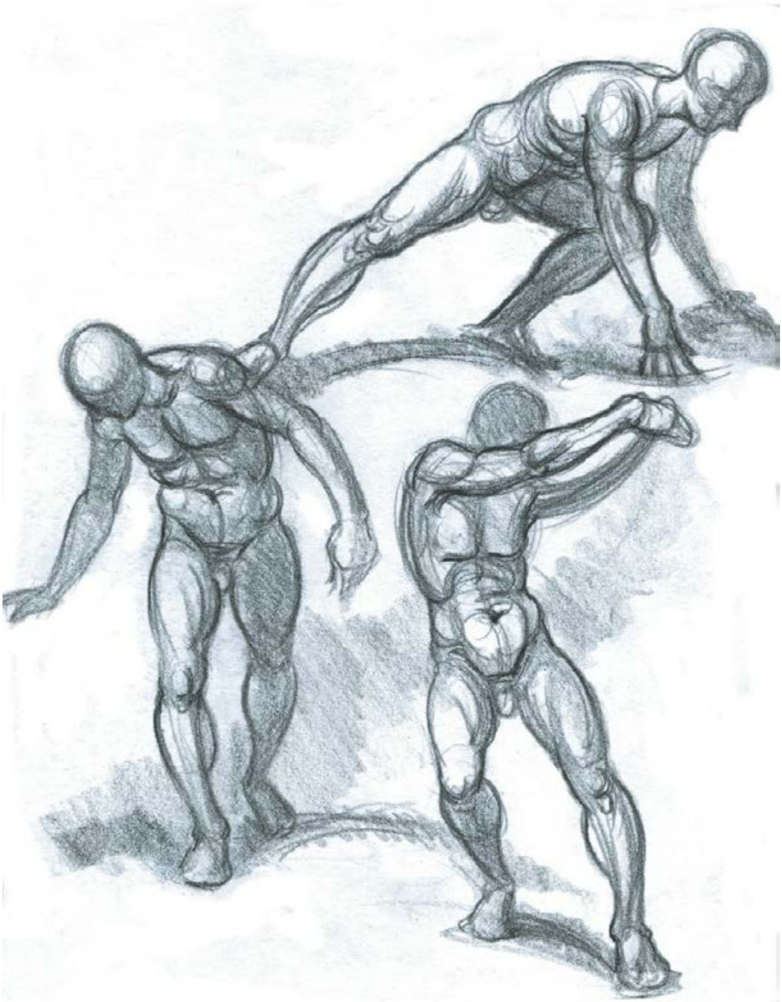
GESTURE STUDY OF A FEMALE FIGURE WITH RIGHT ARM ON HIP

Contour lines and tones approach

Black Conté crayon, sanguine pastel stick, and sanguine pastel dust on newsprint.

3-MINUTE GESTURE STUDIES OF THREE FIGURES

Contour lines and tones approach



Black Conté crayon on newsprint.

Tips on Sharpening Drawing Tools

It’s a good idea to sharpen several drawing tools *before* a drawing session with a model. That way, should your drawing tool—graphite pencil, charcoal pencil, colored pencil, or whatever—become dull or break in the middle of a quick study, you can immediately grab a fresh, sharpened tool without missing a beat. If you have to stop to sharpen a broken pencil, you will lose precious seconds or minutes of the pose, and you will break your momentum. Plus, there is nothing more annoying to a model or to the other artists nearby than hearing someone making scraping noises or using a battery-operated sharpener during a pose.

How you sharpen your tools depends on the tool and your own preference. Many artists hand-sharpen their charcoal pencils or graphite pencils (encased in wood) with a mat knife or X-Acto knife, gently cutting away the wood and then sharpening the exposed graphite or charcoal on a piece of sandpaper. This sharpening procedure works well if you want the tool to produce “calligraphic” lines, with strokes varying from thick to thin. Manual or battery-operated pencil sharpeners are good if you want to keep the tip of the tool sharp for the application of fine lines.

Method #6: The Anatomical Gesture Approach

Poses of 5 to 10 minutes

Because the poses for this approach are somewhat longer, you'll have time to indicate a few anatomical forms, including musculature, within the study. But you have to work briskly, since the poses are still rather brief. Select the anatomical forms you want to emphasize, and keep them simple.

STUDY OF A MALE FIGURE PLACING HIS HANDS AGAINST A WALL

Anatomical gesture approach

Black Conté crayon on white paper.

GESTURE STUDY OF A MALE FIGURE FROM A SIDE VIEW

Anatomical gesture approach

Black Conté crayon on newsprint.

Method #7: The Manikin Approach

Poses of 5 to 10 minutes

In the manikin approach, you draw a very simple figure as a preliminary structure, using geometric or organic shapes. Once this manikin is in place, you add the anatomical forms on top of the preliminary drawing. This approach works well for 5- to 10-minute poses (and for longer poses, as well) because you have the time to quickly set up the basic pose and then to flesh out some of the anatomical form. The key is to keep the manikin simple and very loose. Even 10 minutes is not much time!

When drawing the manikin, use whatever shapes work best for the particular pose—egg shapes for the head and rib cage, wedges or blocks for the pelvis, and cylinders or elongated rectangles for the limbs. Simple directional lines can also be used for the structure of the limbs. Because these are quick studies, the manikin can have a loose or even "rubbery" quality; don't try to establish an accurate geometric structure. Try not to take too much time on this preliminary step; 30 seconds is all you need for a 5-minute study. Once you have the manikin in place, look at the dynamics of the pose to see whether there is any compression, stretching, or twisting of the forms. If so, apply some dynamic lines on top of the manikin to convey what is happening. Remember to limit your emphasis to what is interesting or essential in that particular pose, editing out all unnecessary information.

You might want to purposely emphasize the manikin shape within the final drawing as a way of indicating the basic structure of a particular pose. To do this, you might draw the manikin in a color (a sanguine, say) while using black for the anatomical forms.

Try different drawing tools to see which combination works well for you. Some artists use a light marker to block in the manikin and then use pencil or pen for the anatomical lines. Others use vine charcoal for the manikin and then either a charcoal pencil or pastel pencil for the dynamics of the form. You will be surprised at how much information you can get down on the paper with this method, even in a 5-minute pose.

GESTURE STUDY OF A SITTING FIGURE

Manikin approach

Black Conté crayon on newsprint.

GESTURE STUDY OF TWO FIGURES, EMPHASIZING STRUCTURE

Manikin approach

Sanguine and black Conté crayon on newsprint.

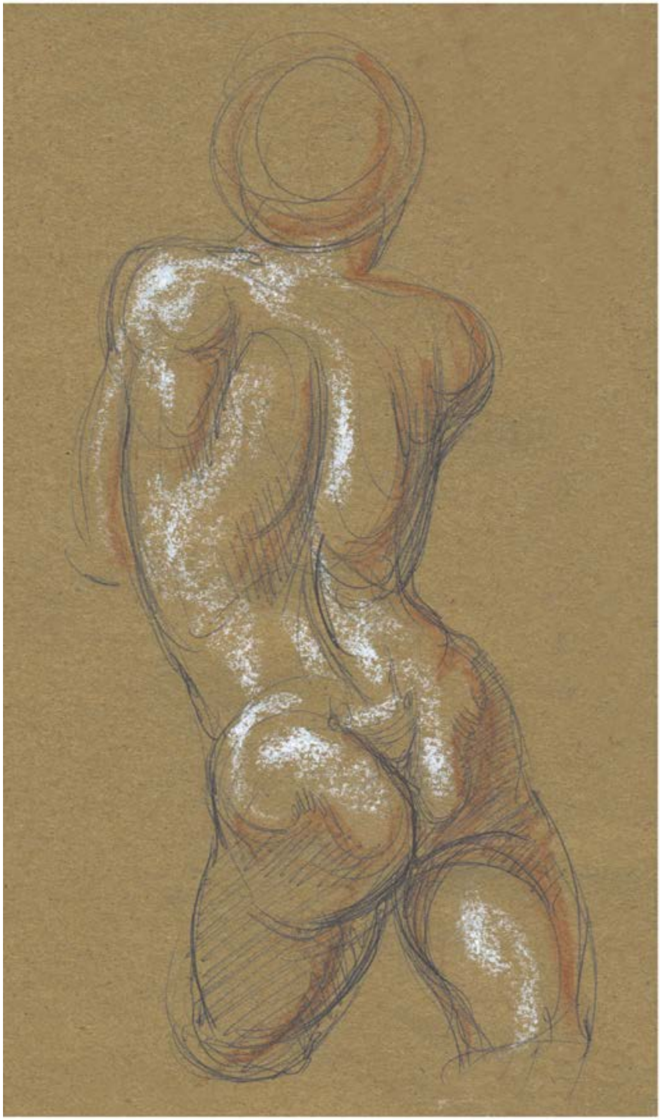
Method #8: The Toned Paper Approach

Poses of 5 to 10 minutes

In this approach, you work on a toned-paper surface. Commercially made toned papers are available in a wide variety of colors, with smoother or rougher textures. For gesture studies done in pastel pencils or charcoal, you should choose a paper that has some "tooth"—that is, that is slightly rough. If working in pen, a slightly smoother paper works better because your pen strokes might snag or skip on a rougher surface. Color is up to you, though many artists stick with neutral tones (grays, beiges) or light blues or greens. For lines and tones, use charcoal pencils, Conté crayons, graphite pencils, watercolor pencils, pastel pencils, or pens (e.g., ballpoint pens, technical pens, brush-marker pens, marker pens with fine or chiseled tips, traditional dip pens, bamboo reed pens). But also add a white or cream-colored drawing tool into the mix—a white Conté crayon, a light pastel pencil, or white charcoal—so that you can capture some of the lights. Work at a brisk pace to give yourself time, near the end of the pose, to apply at least a few lights to the figure.

GESTURE STUDY OF A TORSO IN A BACK VIEW

Toned paper approach



Ballpoint pen, watercolor pencil, and white chalk on toned paper.

GESTURE STUDY OF A FEMALE FIGURE WITH HANDS CLASPED BEHIND HER HEAD

Toned paper approach

Ballpoint pen, graphite pencil, sanguine watercolor pencil, and white chalk on toned paper.

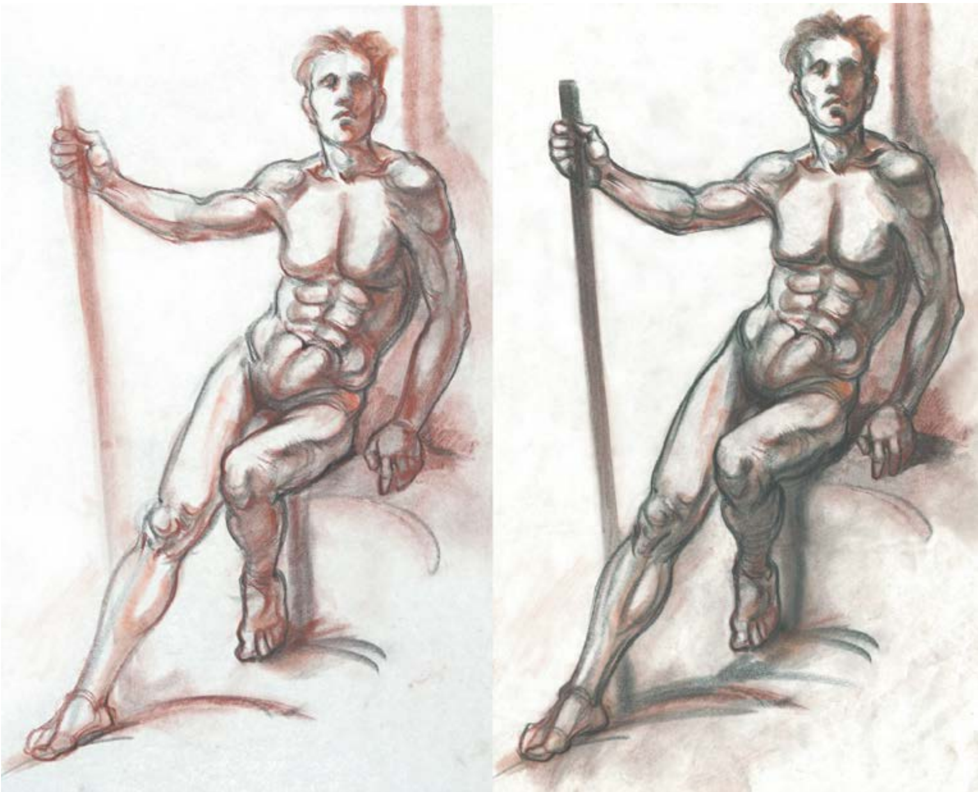
Enhancing Gesture Drawings

Some gesture drawings are magical, capturing the action of a pose in such a dynamic way that tinkering with the drawing would drain it of its vitality. In such instances, it is best not to do any more work on the drawing. Many gesture studies, however, lack energy. So what do you do with lackluster gesture studies? Throw them out? Line the bottom of a birdcage with them?

Don't be so quick to get rid of them. In many cases, you can enhance—and improve—the original gesture drawing by exaggerating the forms, color, and line work. Enhancing gesture drawings can be an exciting exercise. Go through your old gesture drawings and pull out several that you are not thrilled with. Pick one from the pile and go over the line work, angles, forms, tones, or color, refining or tweaking the elements to any degree you want. This might seem contrary to what gesture studies are supposed to be about—capturing the essence of the pose in a very brief amount of time. But certain drawings need a boost, and this is a great way to see how far you can push certain elements. Not having the model in front of you is of no concern, because you already have the basic pose down on paper. This exercise gives you creative freedom, encourages risk-taking, and lets you explore new approaches in your drawing.

Look at the drawing and ask yourself, What do I need to do to make this more exciting? Do I need to exaggerate the pose itself? Enhance a rhythmic quality in the line? Add color to liven it up? Heighten the contrast in values? Then simply dive in, trusting your instincts. Feel free to use drawing tools other than the ones used in the original study. The trick is to avoid overworking the enhancements, which can turn the drawing into a stiff, overanalyzed study. Of course, if you do overwork it, and the drawing goes "past the point of no return," it's no big deal—just move on to another gesture study.

ENHANCED GESTURE DRAWING

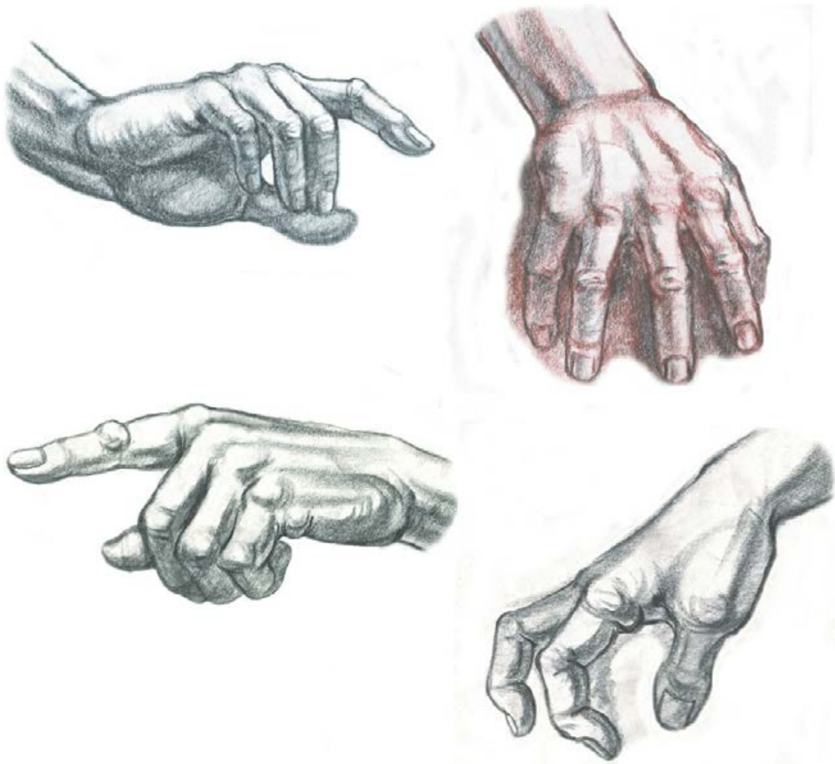


The original gesture drawing, at left, was a 5-minute study done in sanguine and black Conté crayon on newsprint. In the enhanced drawing at right, I used additional black Conté crayon for the added tones and lines.

Gesture Drawings of Body Parts

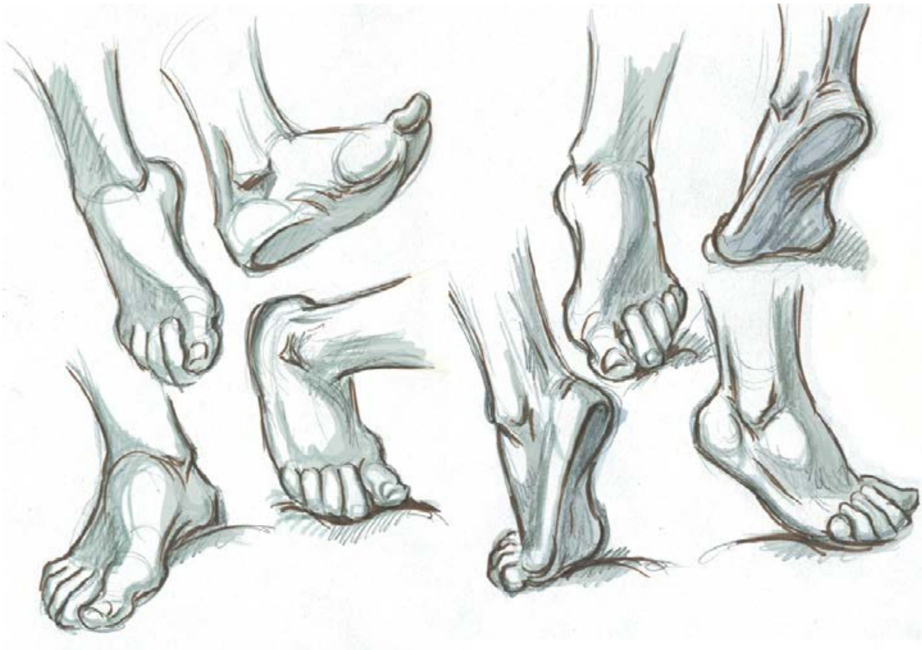
Gesture drawings need not be of the entire figure. If you like, you can focus on just a part of the body—as long as the body part is engaged in some action that your drawing can convey. One advantage of zeroing in is that you'll be able to capture a great deal more anatomical detail within a short period of time. Here are a few examples of gesture studies I've done of hands, feet, and heads. Some are approximately life-size; others are small sketchbook studies.

5- TO 10-MINUTE GESTURE STUDIES OF HANDS



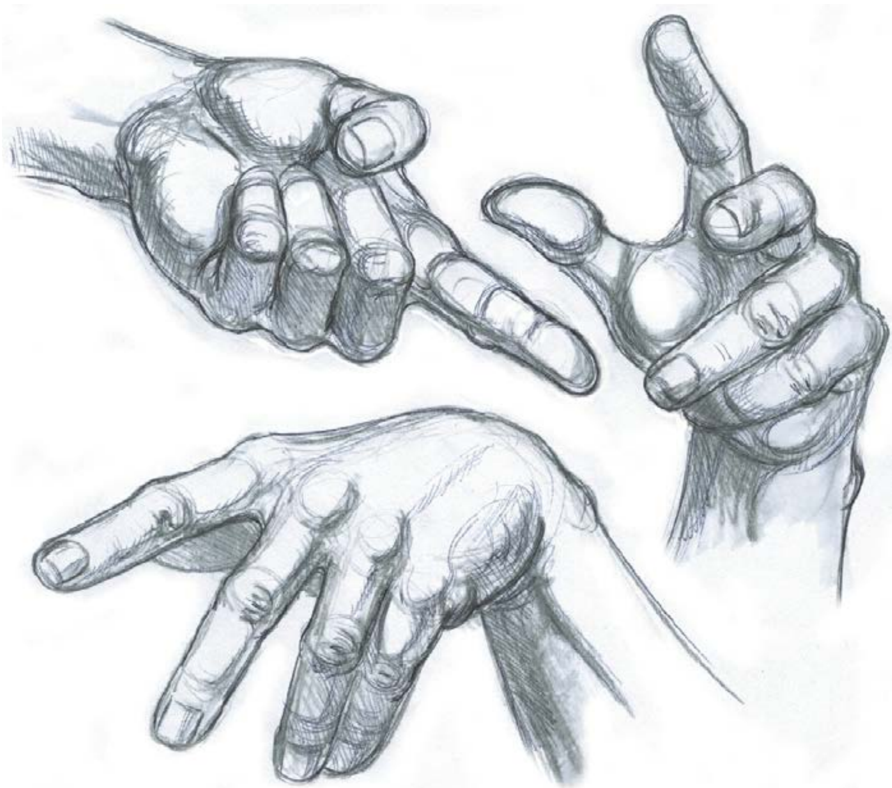
Black Conté crayon on white paper (with added sanguine Conté crayon on the study with spread fingers).

SKETCHBOOK GESTURE STUDIES OF FEET



Graphite pencil, sepia ink, and gray brush-pen on white paper.

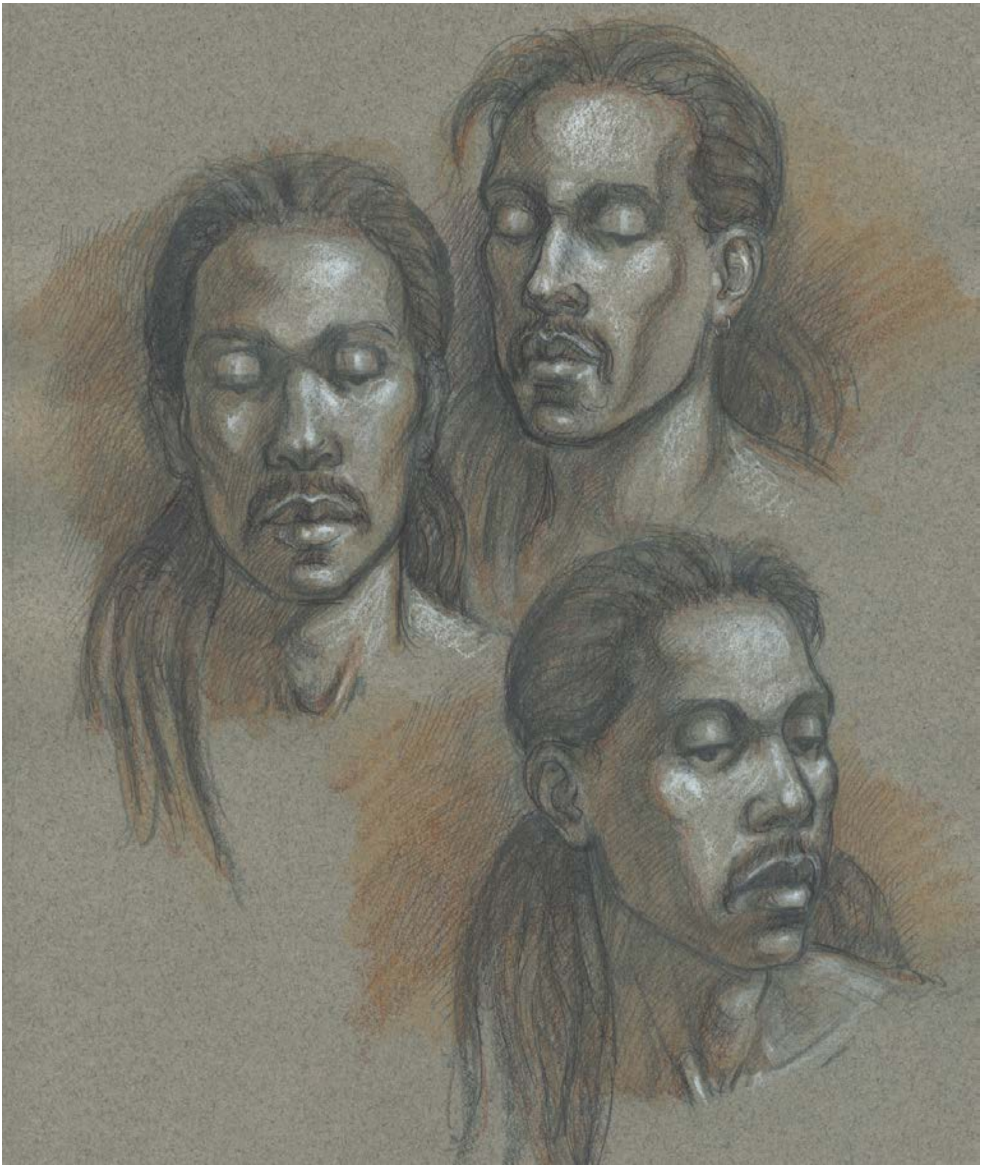
SKETCHBOOK GESTURE STUDIES OF HANDS



Ballpoint pen and gray marker on white paper.

5- TO 10-MINUTE GESTURE STUDIES OF FEET

Black Conté crayon on newsprint.



Graphite pencil and watercolor pencil enhanced with ballpoint pen and white chalk on toned paper.

Practicing Gesture Drawing—Pros and Cons

All figurative artists should try to regularly hone their skills by practicing gesture drawing. There are several ways to do this, each with its pros and cons.

Drawing from a Professional Model in a Studio Setting

Pros: This is one of the best ways to study gesture because the model is trained to hold the pose long enough for you to capture the movement. The best results happen when you have an exceptionally inspiring model who takes on interesting and challenging poses and holds the poses without moving or twitching.

GESTURE STUDY OF A STANDING FEMALE

Black Conté crayon on white paper.

Cons: One downside is that, in a crowded room, you may not have a good view of the model. Also, the model might be uninspiring or unskilled, striking poses that are symmetrical and boring or constantly twitching and moving.

Also, a professional model may not show any emotion. That's fine if, like many traditional fine artists, you are interested only in the dynamics of the figure. But animators, comic book artists, and storyboard artists like to convey moods and emotions—joy, contempt, sorrow, anger, bemusement—in their gesture studies. If the model you're working from is not displaying any emotion, you can still incorporate mood into your drawing by exaggerating the dynamics of the pose, indicating a suggestion of facial expression, or using expressive tones and lines.

The studio environment may itself be less than ideal. Some studio environments are not conducive to working because of annoying noises, talkative people, bad lighting, or

bad temperature control (too cold, too hot). My advice if you encounter any of these problems is to speak up or simply deal with the situation as best you can.

Drawing from Nonprofessional Models

Pros: Serious figurative artists are always hungry to draw from a model and will go to any lengths to practice. But finding a live human model can be challenge. Hiring a professional model or going to a class or workshop might not be possible because of money or time constraints. There is, however, nothing wrong with drawing people you know—friends, family members, or intimate partners. Family members are great for doing quick portrait studies or hand studies. Often, friends will pose for free, but you might encourage them with a promise of compensation (some cash, a meal). Don't forget to allow your "models" to take small breaks, so you don't wear them out. If they cannot hold still, then have them pose comfortably while watching TV, reading, relaxing on a couch, sunning themselves on a patio, or taking a nap. Since gesture studies should be done quickly, you can draw several different views of a stationary pose.

Cons: Since these people are not professional models, they may tend to take rather stiff poses, or they may feel self-conscious and be unable to hold still. Try to keep the session fun and relaxed, but also encourage them to hold the pose as best they can.

Drawing from Photographs

Pros: If you are drawing from a photographic image, you don't have to worry about a model changing position before you are done with a study. That said, it is a good idea to time yourself and to keep the studies brief, otherwise, a "gesture" drawing might turn into a detailed rendering.

Cons: When drawing from a photo, you might be tempted to reproduce the pose too accurately, thereby losing the spontaneous quality gesture studies are supposed to have. So try to keep it loose, and don't spend more than a few minutes on any drawing.

Drawing from Other Artists' Drawings

Pros: Sometimes it's good to look at how other artists approach gesture drawing, for inspiration or to explore a technique. By doing quick little studies from the studies of other artists, living or dead, you can learn how they made their linear or tonal marks—and perhaps how they achieved the sense of magic their drawings convey.

Cons: When you are copying someone else's spontaneous interpretation of an action

pose, your own drawing is unlikely to have the same kind of energy. Remember that you are not trying to become a clone of the other artist, but only to study his or her techniques to give yourself a larger repertoire of skills.

Drawing Ordinary People in Everyday Situations

Pros: Drawing people "in the field"—that is, outside the studio setting—is a great way to study natural body positions, as opposed to the more theatrical poses professional models take. You'll also encounter an endless variety of body shapes. Possible subjects are everywhere: cafés, museums, shopping malls, zoos, beaches, parks, buses, subways, trains, etc. The key is to try to keep yourself inconspicuous, so you won't attract unwanted attention. Do be a bit careful about where you sketch: Shop owners may not appreciate you drawing their customers, and I wouldn't recommend sketching inside houses of worship or at any possibly hazardous site (e.g., a construction zone).

When drawing people in the field, you first need to scan your surroundings to select a subject. If you see a person sitting at a café table in an interesting, relaxed position, try to capture the moment as fast as you can, before the person moves. Since you will be drawing clothed people, you'll face the additional challenge of adding the garments. Sketch the basic pose, then draw the clothes as simple shapes, indicating any obvious folds to help suggest the movement of the fabric.

Cons: People move, which can be frustrating when you're trying to sketch them! It can be very annoying to begin an interesting pose, only to have the person get up and leave. Another downside of drawing people in public is that they may notice that you are drawing them—leading to one of several possible reactions. They may become angry and hostile (I was once chased down the street by a person I'd been sketching). They might just get up and leave the premises immediately. Or they might be curious, walking over to you and beginning a polite conversation about the drawing. If you are the sort of person who craves attention, this might be fine. But many artists sketching in the field consider their drawing time precious and become annoyed when they have to talk to strangers.

There are tricks to prevent being detected when you are drawing people in public. One is to avoid "head bopping" (repeatedly looking up when observing and down when drawing). Another is to keep the sketchbook small and inconspicuous—large sketchbooks are a dead giveaway. If you're working outdoors, wear reflective sunglasses so that people can't tell exactly whom you're looking at. Artists tend to have laser-beam eyes because we study people so intently, which means that sooner or later your selected "model" will feel someone staring at him or her and will look around to see who it is. When you notice that, stop drawing and look elsewhere nonchalantly. Continue with the drawing only when your subject gives up looking and resumes

whatever he or she was doing.

Drawing from Memory or Imagination

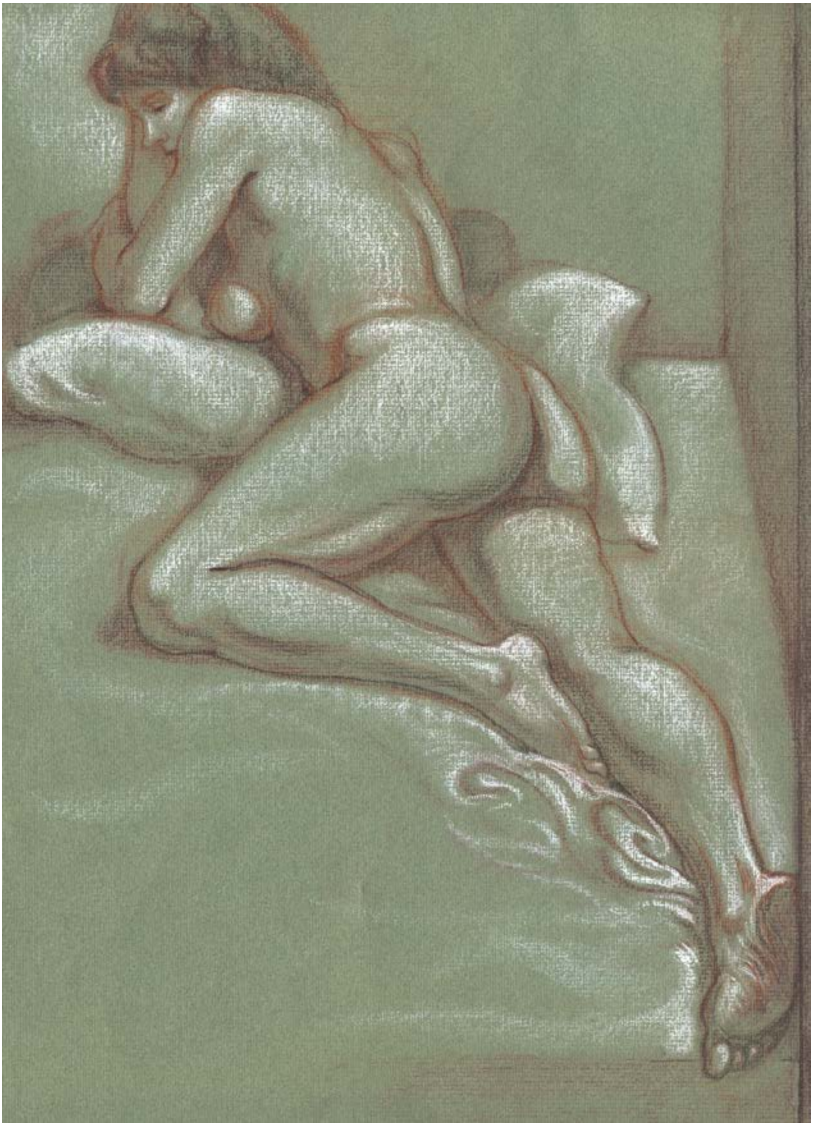
Pros: Once you have a basic grasp of the foundations of figure drawing (proportion, structure, anatomical forms), you can start drawing figures in various poses from memory. Daily or weekly practice in drawing from actual models, looking at other artists' work, and studying anatomical forms and joint movement will enhance your memory work considerably.

Learning to draw figures from your imagination is well worth the effort. People who do animation, storyboard art, and comic book art work extensively from their imaginations, especially at the beginning stage of a project when they are mapping out their figures' actions. But this skill is just as important for fine artists and illustrators, who often need to do thumbnail sketches when developing ideas for paintings, illustrations, or sculptures. Once their ideas are sketched out, they can hire models to work from directly or to do a photo shoot for reference material. Being able to work from memory can even be helpful when you're working from a photo reference. If the figure in the photo isn't posed exactly as you'd like, you can easily and accurately change the position of a head, arm, or leg in your drawing studies.

Cons: Because this method tests your anatomical skills, it can be excruciatingly challenging. Even if you've achieved a certain level of skill at drawing from live models, you may feel like a rank beginner when you first try to draw from your head. But this is typical. Don't let it frustrate you so much that you no longer want to pursue memory work. The key is to keep practicing. The more you draw from memory and imagination, the stronger your drawings will become.

GESTURE DRAWING OF A FIGURE SITTING ON A PEDESTAL

Black Conté crayon on newsprint.



RECLINING FEMALE FIGURE

Sanguine and brown pastel pencils and white chalk on toned paper.

Chapter 11

Finding Movement within the Stationary Figure

Many traditional figurative artists depict stationary figures or figures captured in just one phase of movement. Even though the figure is not actually moving (as an animated figure does), it is still desirable to find a sense of movement within the pose, creating a flowing rhythm or dynamic tension throughout the forms. Finding the movement within a stationary pose gives the figure energy that can be subtle or dynamic, depending on the pose and the artist's intention.

In this chapter, I continue to break down the figure's forms into simple structures to help you understand the mechanics of movement. I also explore ways of recognizing the indications of movement (subtle or dynamic) that occur in various poses. A strong directional alignment of body parts (e.g., torso, limbs, head), usually referred to as a *line of action,* can help create the illusion of movement within a stationary figure. Artists can also indicate how the muscles are stretching and compressing, giving a figure in a drawing, painting, sculpture, or digital image a sense of internal energy. Understanding movement within the forms can help artists who work extensively from imagination or memory, sharpening their awareness of how far to exaggerate the forms without distorting them or losing the vitality of the action.

The "Four T's"

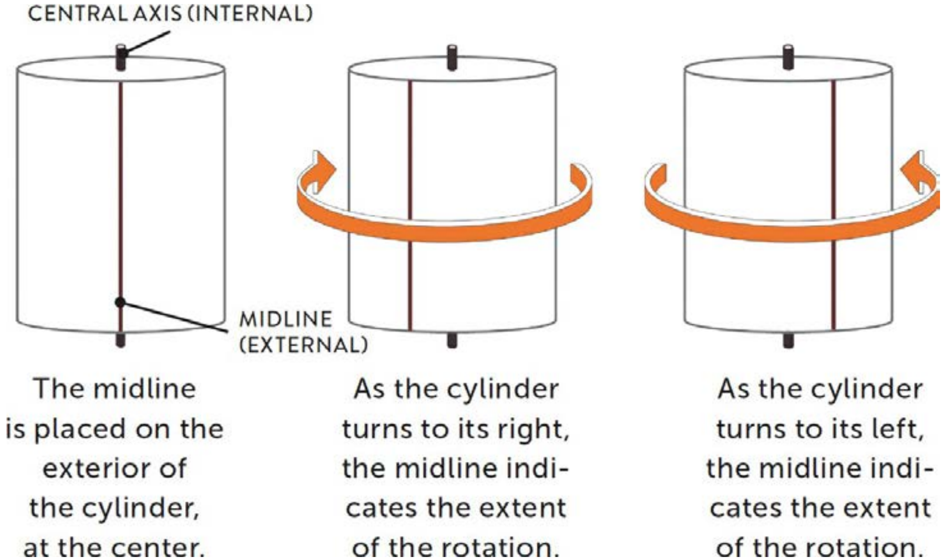
Anatomical structures can change spatial position in four basic ways, which are sometimes referred to as the "four T's": *turning, tilting, tipping,* and *twisting.* To understand the basic principles of these movements, it can be helpful to simplify the figure into extremely basic shapes. Here, I use a cylinder form that can represent the rib cage, torso, or head, showing how it changes in each action. The same principles can be applied to elongated cylinders used to represent the upper and lower arms and legs, or, in fact, to any basic shape (block, oval, etc.) that you might use to construct a figure.

As you study the drawings that follow, be aware that every structure has a *central axis*. In a cylinder, this axis is an imaginary line traveling though the center of the cylinder from top to bottom. When the cylinder turns, it is rotating around its central axis. For artistic purposes, however, the *midline* often functions as the central axis. The midline has the same alignment as the actual central axis but is positioned externally, on the surface form, not internally. In front views of the rib cage, the midline is along the sternum (breastbone); in back views, it is along the vertebral column. When the rib cage rotates, it is turning on its actual central axis (the invisible imaginary line in the center of the rib cage), but we can monitor how much rotation is occurring by observing the placement of the midline (the sternum or vertebral column, depending on the view).

Turning Movement

Turning is the rotation or pivoting of a structure around its central axis. At the left in the next drawing is a basic cylindrical shape with a vertical line placed at the center on the exterior. This center line represents the midline.

TURNING MOVEMENT OF A CYLINDER



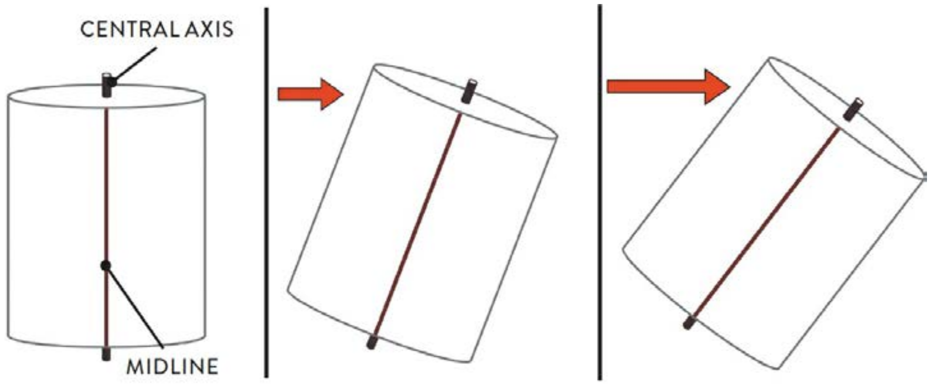
Let us assume the cylinder symbolizes a rib cage. If the rib cage is facing you, the sternum is positioned on the midline. When the rib cage turns to either the left or right, the sternum (on the midline) moves off-center, showing how much rotation is occurring. The middle cylinder in the drawing is turning toward its own right, and the cylinder on the right is turning to its left. As simple as this principle is, beginning art students sometimes fail to see how the rib cage rotates in certain poses, thereby missing the opportunity to indicate movement.

Note that turning is *not* a twisting action, because the rotation occurs on only one structure. Two structures must participate in a twisting action: one rotating in one direction while the other structure rotates in a slightly different direction.

Tilting Movement

In a tilting movement, a form bends to the side, away from a vertical alignment. The cylinder at the left in the top drawing represents an upright frontal view, with the midline again placed along the center of the exterior surface. The middle cylinder shows a slight tilting action, and the cylinder on the right shows a more dynamic tilt. When drawing a tilting figure, the easiest way to ascertain the degree of the tilt is to hold your pencil in front of you and align it with the model’s tilting rib cage. Another way to assess the extent of a tilt is to think of the face of a clock: Is the central axis of the form positioned at a certain “hour” (one o’clock, two o’clock, etc.)?

TILTING MOVEMENT OF A CYLINDER



The cylinder is in an upright position.

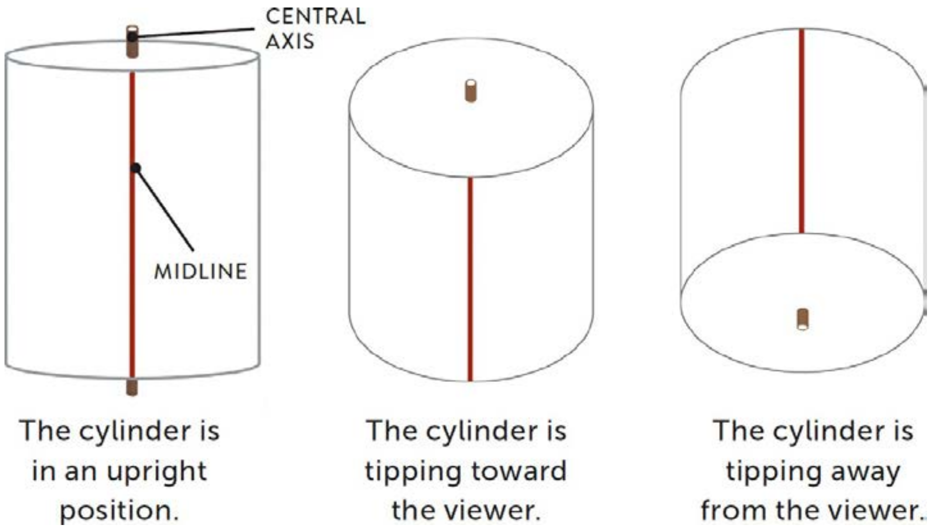
The cylinder is tilting slightly away from a ver-tical alignment.

The cylinder is tilting farther away from a ver-tical alignment.

Tipping Movement

Tipping is another term for bending, but in this case the bending is toward or away from the viewer. The cylinder at the left in the middle drawing represents an upright frontal view, with the midline again placed along the center of the exterior surface. The middle cylinder is tipping toward the viewer, while the right cylinder is tipping away. In anatomy, the term *flexion* is used for a movement in a forward direction (such as a torso bending forward), and the term *extension* for a movement returning the form back to its original position or moving it even farther in a posterior (backward) direction. (This farther backward movement is sometimes called *hyperextension.*). In poses where there is some foreshortening, as when a torso tips toward the viewer, the tipping cylinder works well as a structural shape.

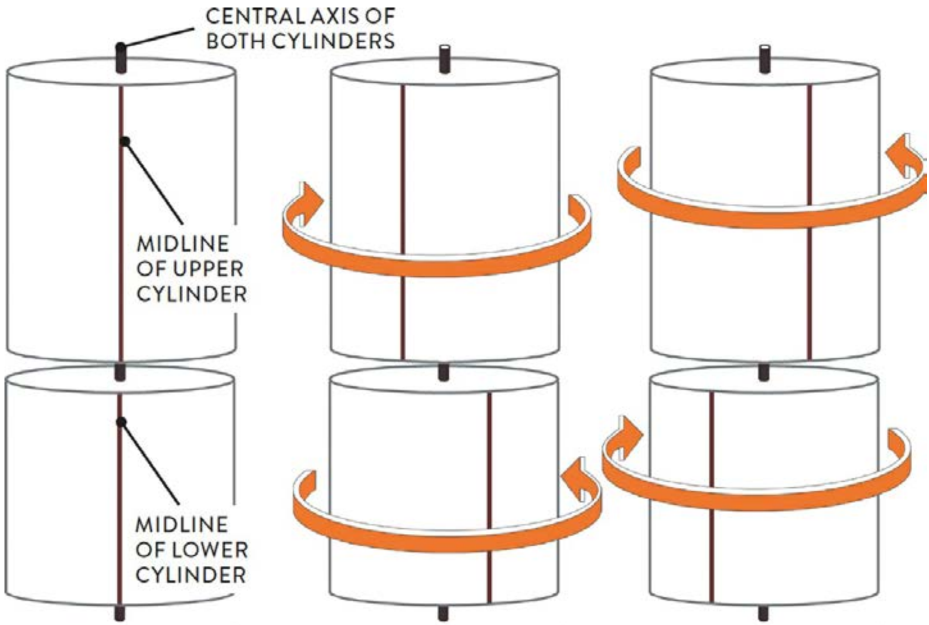
TIPPING MOVEMENT OF A CYLINDER



Twisting Movement

Twisting is a spiraling action involving more than one form. Generally speaking, a twisting movement can only occur if one structure (such as the rib cage) turns in one direction while another structure (such as the pelvis) is turning in a different direction. This creates a torque between the two structures and usually twists the soft tissues connecting them. At the left in the bottom drawing opposite are two stacked cylinders facing forward in the normal, upright position, with their central axis placed in the internal center and the midline placed along the center of the exterior. In the middle, the upper cylinder is turning toward its right while the lower cylinder turns toward its left. On the right, the twisting movement is reversed.

TWISTING MOVEMENT OF TWO CYLINDERS



The two stacked cylinders are both facing forward, with their midlines placed on their exteriors.

The upper cylinder is turning toward its right while the lower cylinder turns toward its left, creating a twisting action.

The upper and lower cylinders turn in opposite directions, reversing the twisting action.

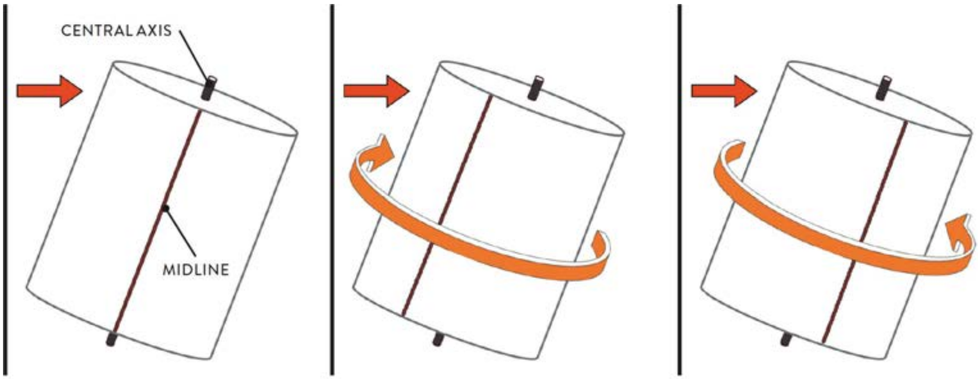
Note that there are anatomical exceptions to this rule. A single muscle—for example, the brachioradialis of the radial group of the upper arm—can twist in a spiraling motion, depending on the action and the position of the bones it attaches to.

Combining Tilting and Turning

Of course, the movements of turning, tilting, tipping, and twisting are often combined in various ways in the living, moving human figure. Let’s examine one such combination: a movement in which one structure rotates and tilts at the same time. The cylinder at left in the next drawing is facing forward (with the midline at the center) but tilting at an angle.

(Note that there is no foreshortening occurring here.) The cylinder in the middle is tilting at the same angle but is turning toward its right, as indicated by the midline, and the cylinder on the right is tilting and turning toward its left. As a general rule, you should always check to see if there is any rotation going on in a tilting structure you are drawing.

COMBINING TILTING AND TURNING IN A CYLINDER



RED ARROWS: Direction of tilt away from a vertical alignment
ORANGE ARROWS: Direction of rotation

Movements of the Head

When drawing the head in any position, first indicate its basic shape using an oval, egg shape, or modified skull shape or just a simple cylinder or block. Whichever shape you use, be aware of the head's central axis—the invisible imaginary line running vertically through the center. Also indicate the midline of the head, using it as a guide for the placement of the facial features, which are positioned on lines perpendicular to the midline. (For more on the placement of facial features, see this page.)

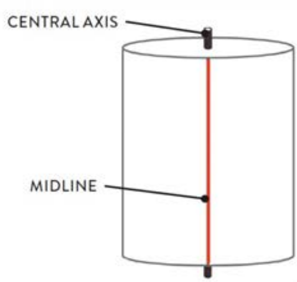
The placement of the midline will, of course, change depending on whether the head is facing forward, rotating to the left or right, or tilting away from a vertical alignment. Likewise, the positions and directions of the brow line, eye line, nose line, and mouth line will also turn and tilt depending on the type and degree of action taking place in the head. When the head is looking up or down, these horizontal lines will follow the general curvature of the head, as they would on a cylinder.

Turning of the Head

Any position the head takes between a frontal view and a profile view is referred to as a *three-quarter view.* As the head turns, or rotates, farther away from a frontal view, the less you will see of the features on the far side of the midline. The head at the left of the drawing on this page is facing the viewer directly; at the middle and right, the head is shown rotating away to a lesser and greater extent.

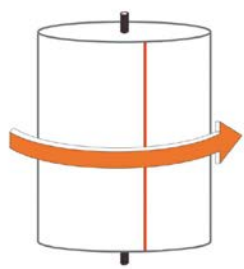
TURNING OF HEAD

Vertical alignment of the head



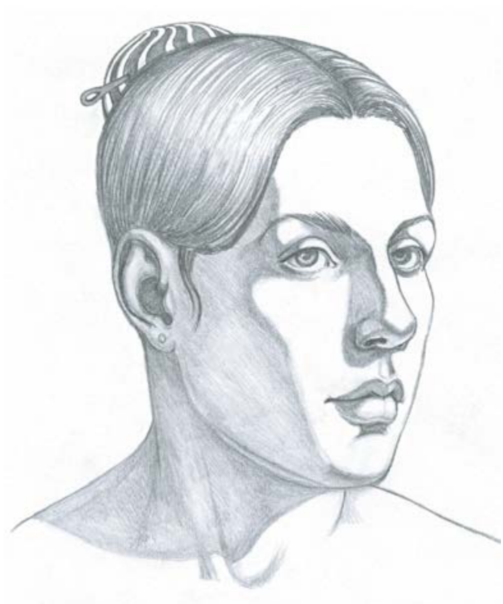
The central axis and midline are positioned vertically, at center.

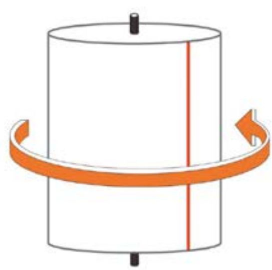
Head turned slightly toward its left



The central axis does not move, but the midline turns toward the cylinder’s left.

Head turned farther toward its left





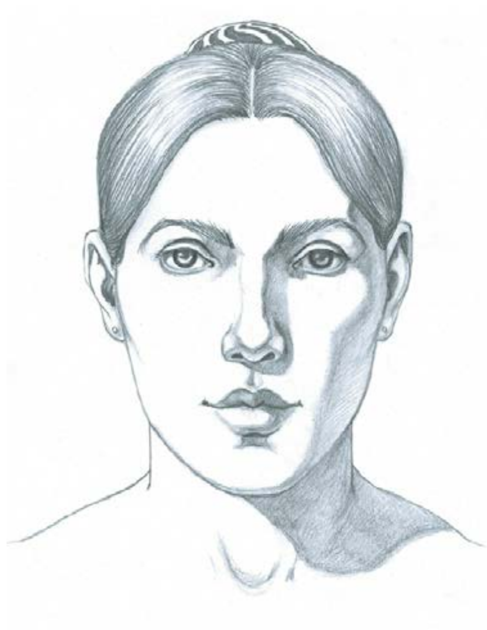
As the central axis remains stationary, the midline turns farther to the cylinder's left.

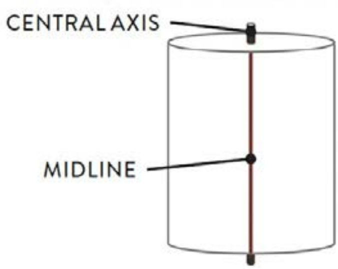
Tilting of the Head

When the head tilts sideways (lateral flexion of the head), it leans toward the right or left shoulder to a lesser or greater degree. You can determine the position of the central axis and midline by comparing the angle to a vertical alignment nearby, such as the vertical sides of your drawing board or a vertical structure in the background. The cylinders in this drawing show this change of angle.

TILTING OF HEAD

Vertical alignment of the head





The central axis and midline are positioned vertically, at center.

Head tilted toward left shoulder

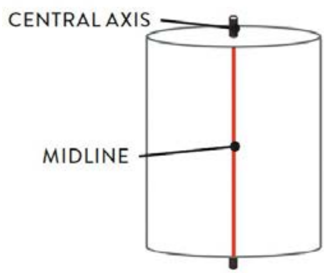
The central axis and midline indicate how much tilting is occuring in the cylinder.

Tipping of the Head

The action of tipping the head in a forward and downward direction is called *flexion of the head and neck.* That of tipping the head back, with the chin moving in an upward direction, it is called *extension of the head and neck.* A frontal view of either action will produce some foreshortening of the features. Although the central axis and midline remain vertical, the eye, brow, nose, and mouth lines appear to curve around the facial structure. As the head looks down, the lines of the facial features curve slightly upward; when the head looks up, they curve downward, as can be seen in the following drawing.

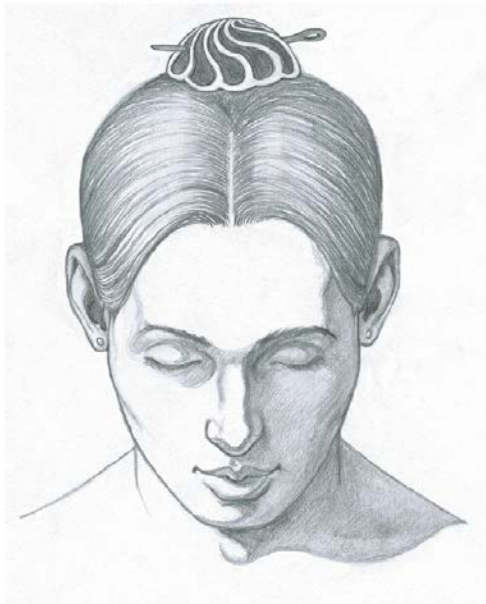
TIPPING OF HEAD

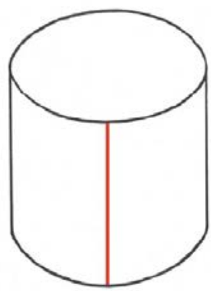
Vertical alignment of the head



The central axis and midline are positioned vertically, at center.

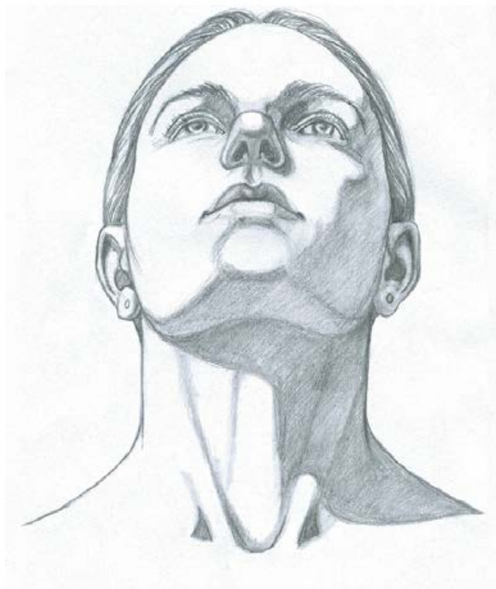
Head tipping forward

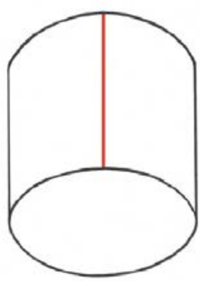




The cylinder is tipping forward.

Head tipping back





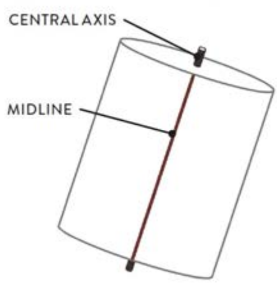
The cylinder is tipping back.

Combining Tilting and Turning of the Head

In action poses, the head will often be tilting and rotating at the same time. In depicting such an action, the first step is to establish the basic shapes of the head, neck, and shoulders and their positions in relation to the torso. Indicate the midline of the head to see how much rotation and tilting is occurring, then position the features accordingly.

COMBINING TURNING AND TILTING OF HEAD

The head is tilting away from a vertical position while facing front.



The cylinder is tilting away from a vertical alignment.

The tilting alignment is the same, but the head is turning toward its right.

The tilt of the central axis is the same, but the midline is turning toward the cylinder's right.

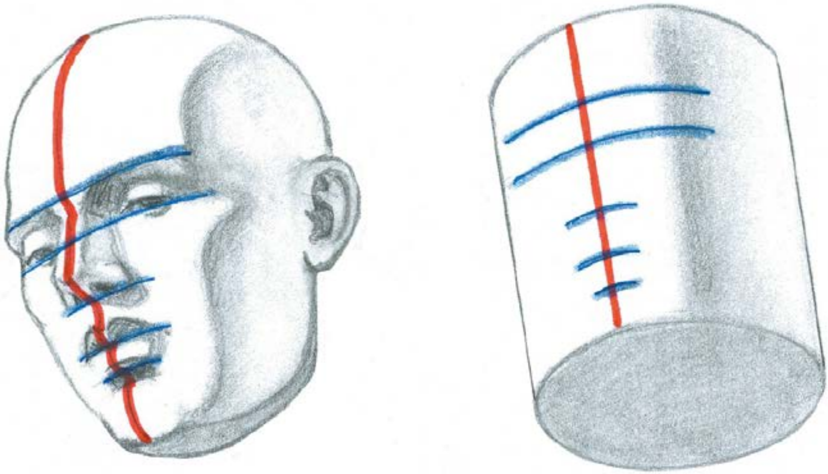
The tilting alignment is the same, but the head is turning toward its left.

The tilt of the central axis is the same, but the midline is turning toward the cylinder’s left.

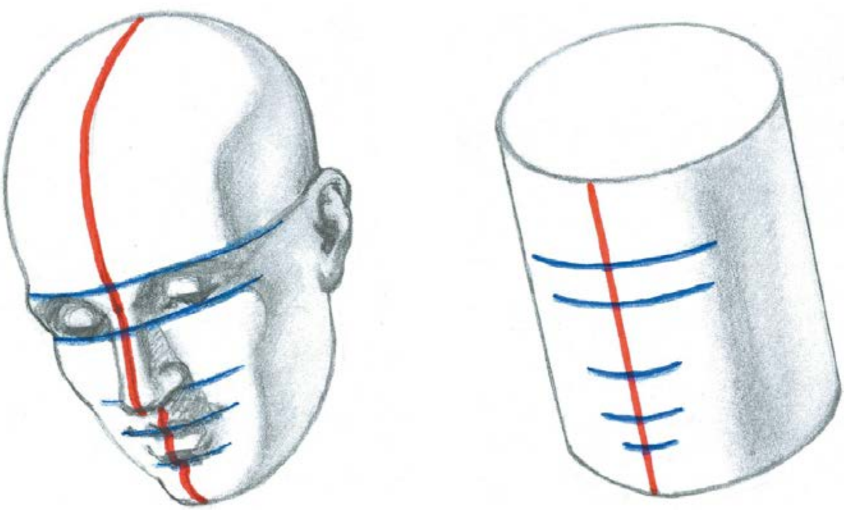
Combining Turning, Tilting, and Tipping of the Head

The head is capable of turning, tilting, and tipping (backward or forward) all at once. When setting up the position and general shape of the head in a pose, find the midline, which will tell you right away if the head is both turning and tilting. Then see whether there is any foreshortening indicating that the head is tipping toward or away from you. As you add the feature lines (brow line, eye line, mouth line), make sure they follow the slightly curving alignment (downward or upward) that occurs when the head is tipping. The placement of the midline and facial lines in such poses is shown in the top drawing

on the following page.



The head is tipping back, with a turning and tilting movement.



The head is tipping forward, with a turning and tilting movement.

Tilting Movements of the Torso

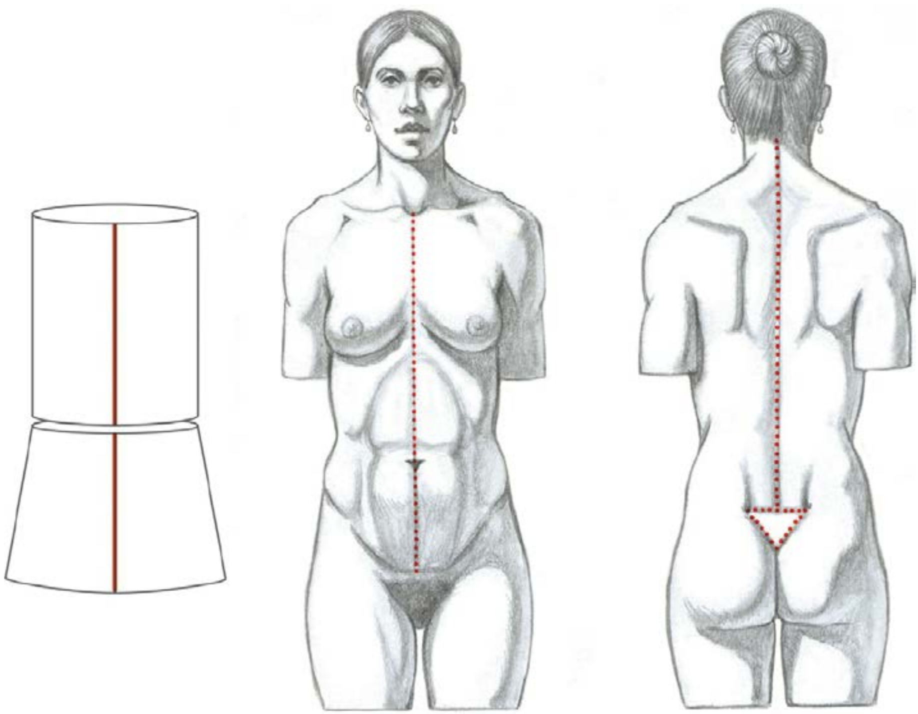
Assessing the angles of tilts is important for understanding what is occurring in most poses, even relatively passive ones. While it is not necessary to get the tilt absolutely correct in brief gesture drawings, in longer studies you should take the time to check the actual angles in all parts of the pose. Getting the tilts right minimizes proportional problems, preventing the impression that the drawing looks somehow "off." If you do get that feeling, it usually means that an angle is not in the right position and that you have therefore mistakenly shortened or lengthened a structure.

In the following examples, I have broken down the torso into two shapes: a cylinder representing the rib cage and a slightly flared cylinder shape representing a female pelvis. (The male pelvis, with its narrower hips, can be represented with a square block shape.) There are numerous variations on these actions, depending on the degree of the tilts and the relative positions of the rib cage, pelvis, and head.

Vertical Alignment of the Rib Cage and Pelvis

The next drawing shows a vertical alignment of an upright torso, sometimes referred to as the *neutral position of the torso*. In the front view of the vertical torso, the midline begins at the pit of the neck, travels through the sternum (breastbone) and navel, and terminates in the pubic bone. In the back view, the midline goes from the base of the skull along the vertebral column to the sacrum.

VERTICAL ALIGNMENT OF RIB CAGE AND PELVIS



LEFT: Midline of torso

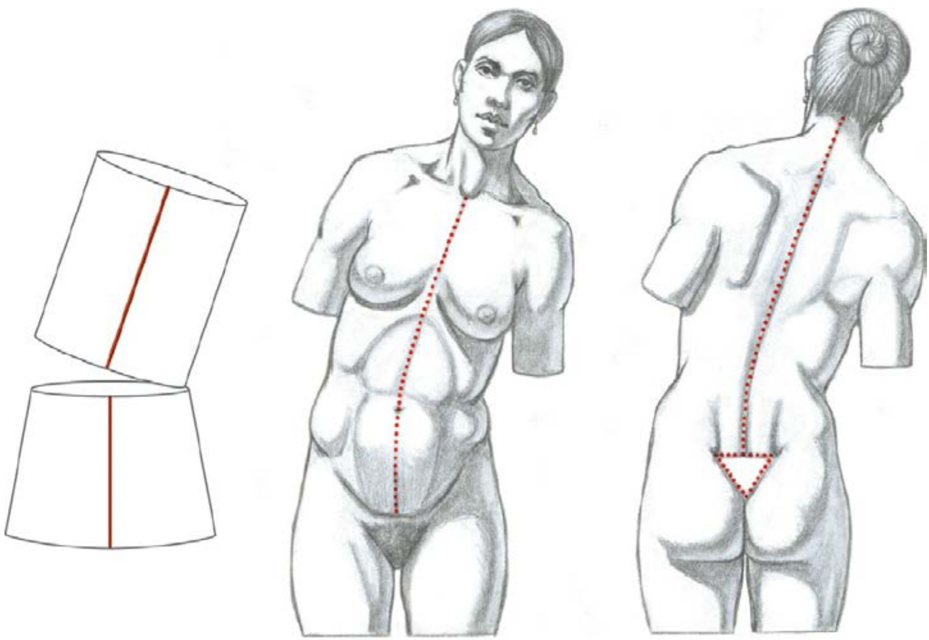
CENTER: Anterior view

RIGHT: Posterior view

Tilting Rib Cage with Stationary Pelvis

The rib cage and pelvis can tilt independently of each other. In the drawing below, the pelvis remains stationary while the rib cage tilts to one side. This causes a slight curve in the midline of the whole torso unit.

TILTING RIB CAGE WITH STATIONARY PELVIS



LEFT: Midline of torso

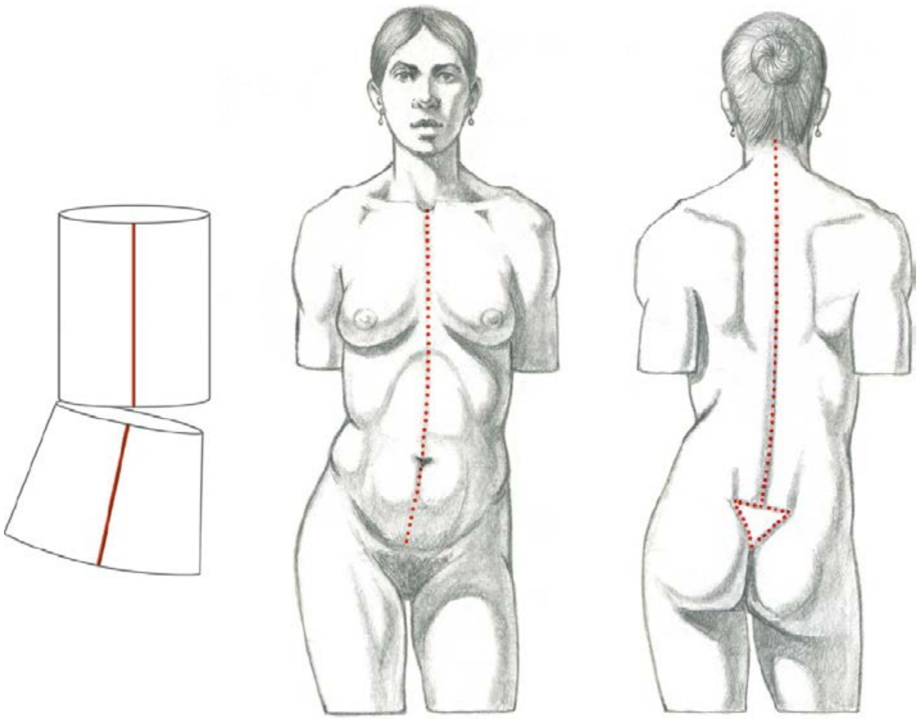
CENTER: Anterior view

RIGHT: Posterior view

Tilting Pelvis with Stationary Rib Cage

The following drawing shows an opposite sort of movement, in which the rib cage remains stationary while the pelvis tilts toward one side. This likewise creates a subtle curve in the midline.

TILTING PELVIS WITH STATIONARY RIB CAGE



LEFT: Midline of torso

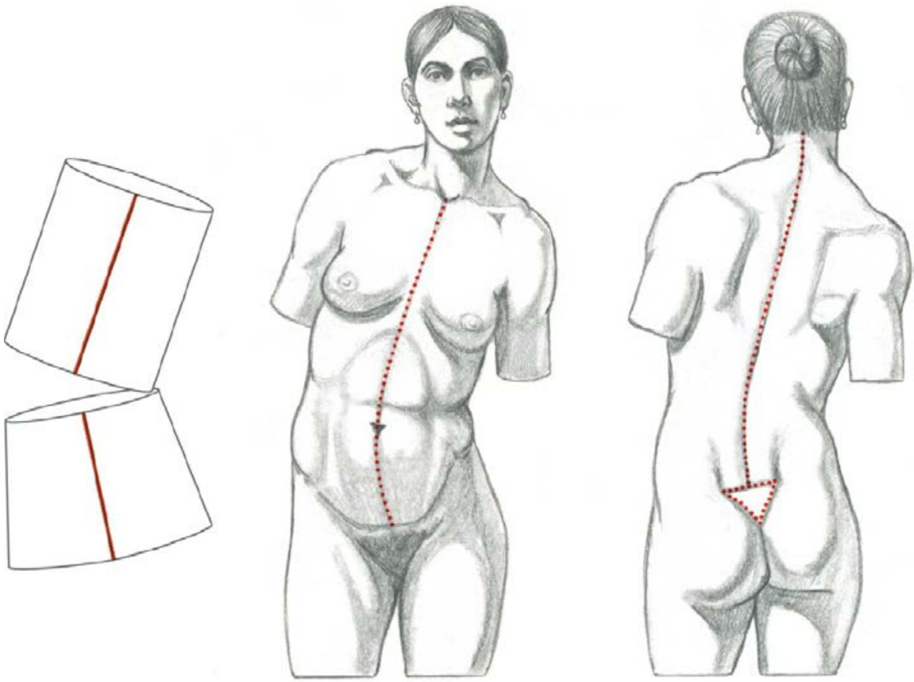
CENTER: Anterior view

RIGHT: Posterior view

Tilting Rib Cage and Tilting Pelvis

The following drawing shows both the rib cage and pelvis tilting, producing a more dynamic tilting action of the whole torso unit. The midline now has a more serpentine, curving alignment.

TILTING RIB CAGE AND TILTING PELVIS



LEFT: Midline of torso

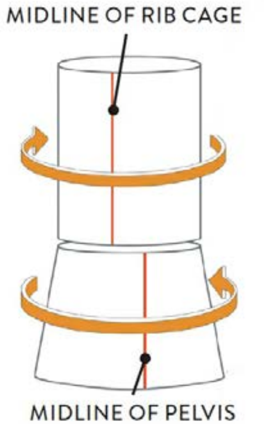
CENTER: Anterior view

RIGHT: Posterior view

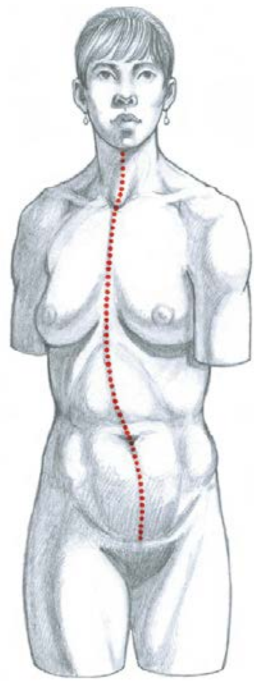
Basic Twisting Movement of the Torso

Now, let’s look at how the torso can twist, again using a cylinder for the rib cage and a slightly flared cylinder for the (female) pelvis. On the following drawing, the upper cylinder is rotating slightly in one direction while the lower cylinder is rotating slightly in the opposite direction. The images at the middle and right are front and back views of a torso showing this twisting action taking place. When there is any kind of twisting action in the torso, the midline will have a serpentine alignment, from the pit of the neck to the public bone in front views, or along the vertebral column in back views.

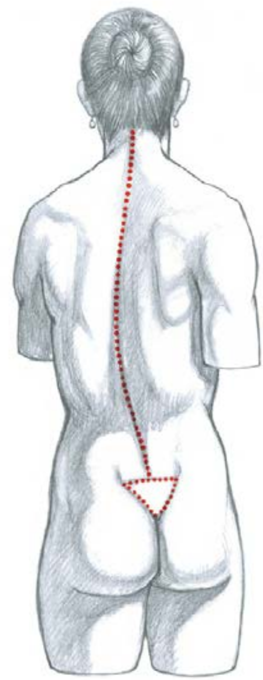
BASIC TWISTING MOTION OF VERTICAL TORSO



The upper cylinder (rib cage) is rotating slightly in one direction while the lower cylinder (pelvis) is rotating slightly in the other direction.



Anterior view



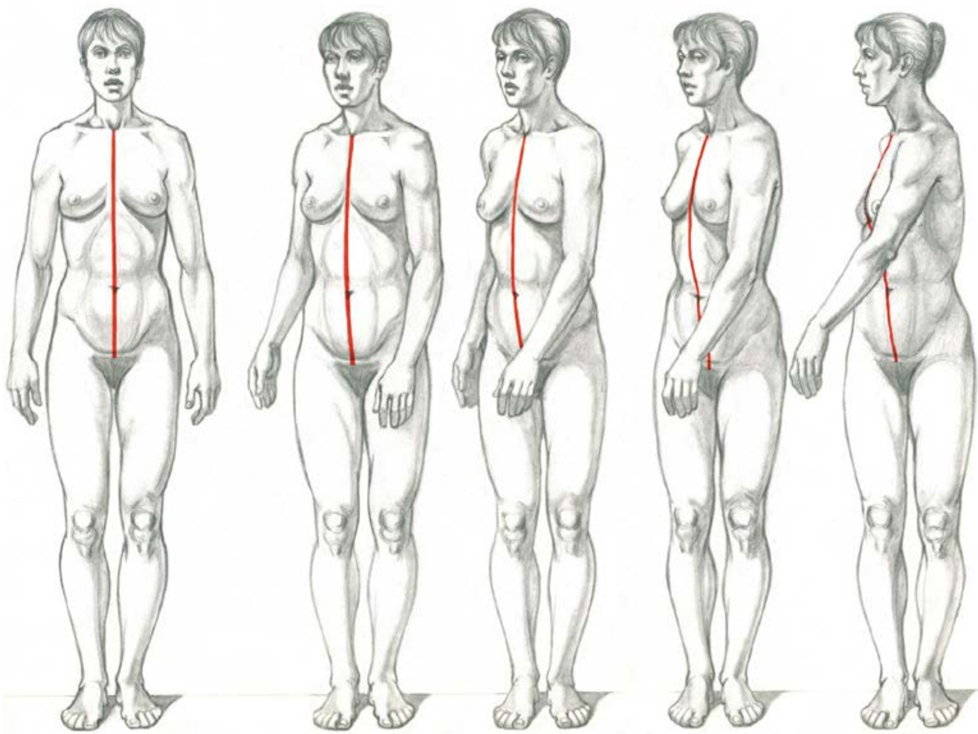
Posterior view

Continuous Twisting Movement of the Whole Figure

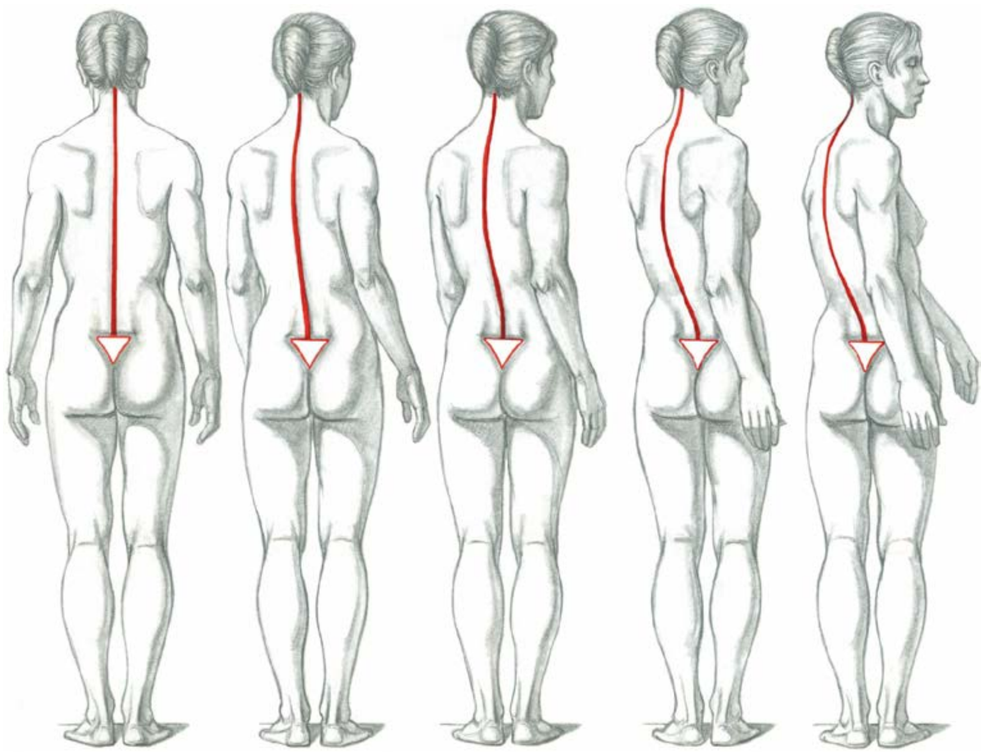
When the whole figure is twisting, the feet are usually firmly planted and stationary. As the rib cage twists in one direction, the pelvis remains more or less stationary. This action can be subtle or dynamic, depending on the degree of the twist, the action of the arms, the placement of the legs, and the angle of the head.

The two following drawings are anterior (front) and posterior (back) views of a female figure continuously twisting. Her feet are firmly planted on the floor, and her arms swing in response to the twisting action of her upper body. You can see how much torque and tension is occurring in the upper body by observing the midline of the torso (represented by a red line in the drawings). In the front view, the midline travels from the pit of the neck down to the pubic bone of the pelvis; in the back view, the midline lies along the vertebral column, traveling down to the sacrum bone of the pelvis. The more dynamic the twist, the more the torque will affect the "stationary" pelvis. Even though the feet are firmly planted, the pelvis will pivot slightly because of the tension the twist creates in the vertebral column. As the torso twists, the head can either move with the twisting action or turn in opposition.

CONTINUOUS TWISTING MOVEMENT OF WHOLE FIGURE



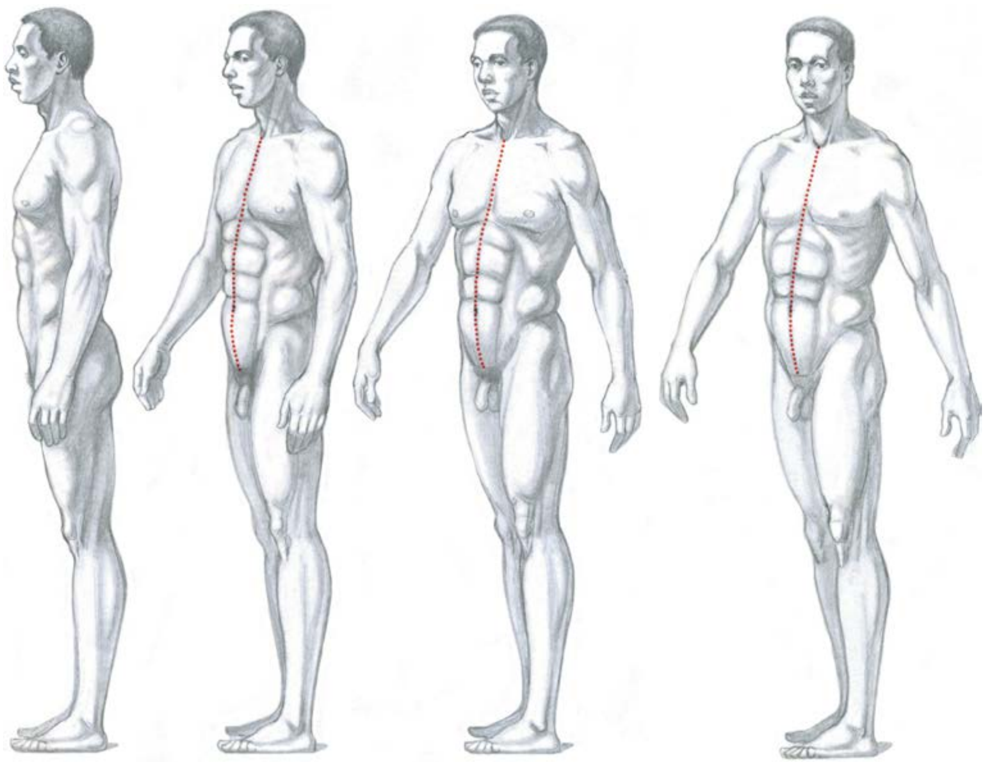
Anterior view



Posterior view

The next drawing shows a continuous twisting movement of a male figure from a lateral (side) view. With his feet firmly planted, the figure begins to turn his torso toward his left, producing a spiraling action within the whole torso. Although the twisting action is more noticeable in the rib cage, there is also a small amount of movement in the pelvis. Again, the key to assessing any twisting action is to look for the midline of the torso. The farther the figure twists, the more the midline curves, emphasizing the fluid relation between the rib cage and pelvis structures. The natural swing of the arms underscores the twisting, spiraling action.

CONTINUOUS TWISTING MOVEMENT OF WHOLE FIGURE



Lateral view

Axes of Movement

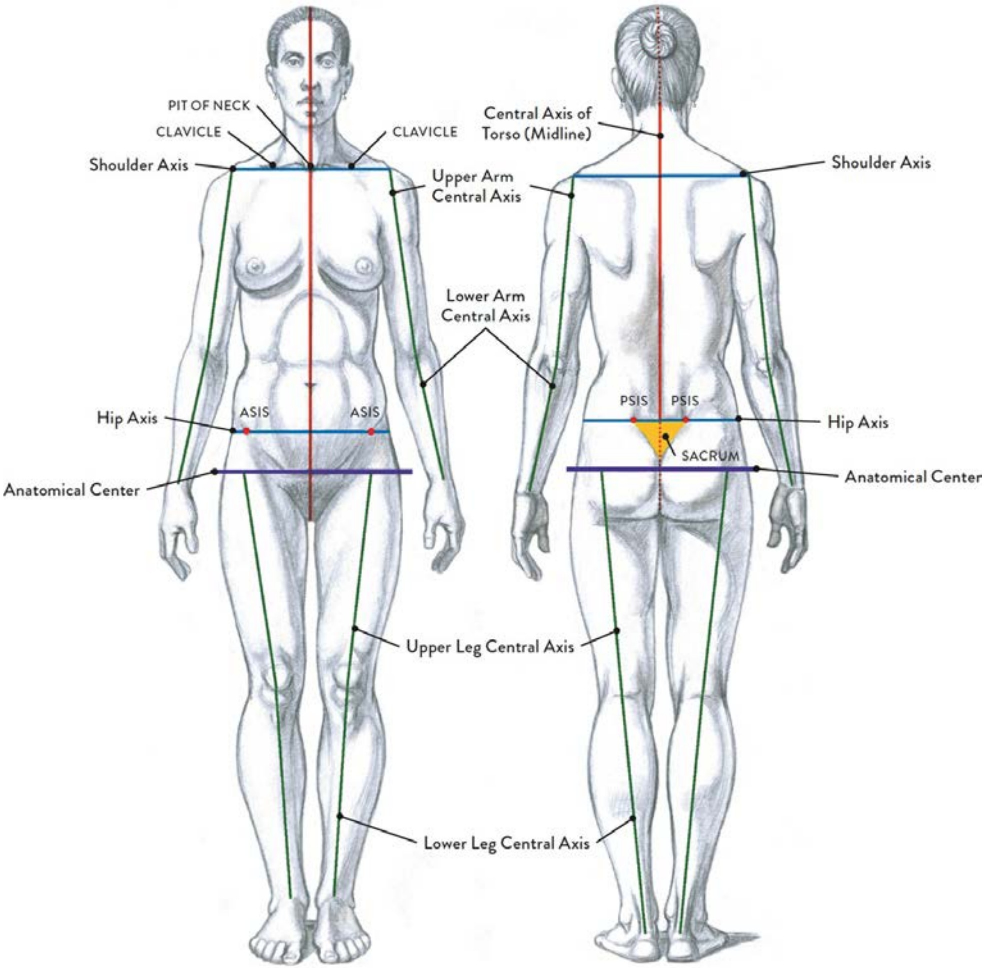
In most poses, you can see the general action immediately merely by locating the central axis or midline of the whole figure. In addition, you should look for two other axes: the *shoulder axis* and *hip axis.* In standing poses, these are usually more or less perpendicular to the vertical central axis of the figure, but they align in different configurations in various turning, tilting, and twisting actions.

The shoulder axis is an imaginary horizontal line that runs through both collarbones (clavicles) and the pit of the neck. Some artists begin this line at the very outer tip of the shoulder (acromion process) and run it through to the other shoulder's tip.

In an anterior view, the hip axis is an imaginary horizontal line connecting the ASIS landmarks—the bony protrusions at the anterior ends of the iliac crest, or upper rim, of the pelvis. Some artists start the hip axis at the outer edge of the hip and run it through both ASIS landmarks and over to the opposite edge of the hip. In a posterior view, the hip axis connects the PSIS landmarks—the sacral dimples on either side of the upper border of the sacral triangle (sacrum) of the pelvis. Again, the line can be extended to the outer edges of the hip.

These axes and features appear in the drawing opposite, as does a line marking the *anatomical center.* The anatomical center divides a vertical standing figure halfway between the top of the head and the bottom of the feet, traveling from the greater trochanter of one femur (bone of upper leg), through the pubic bone, to the greater trochanter of the other femur.

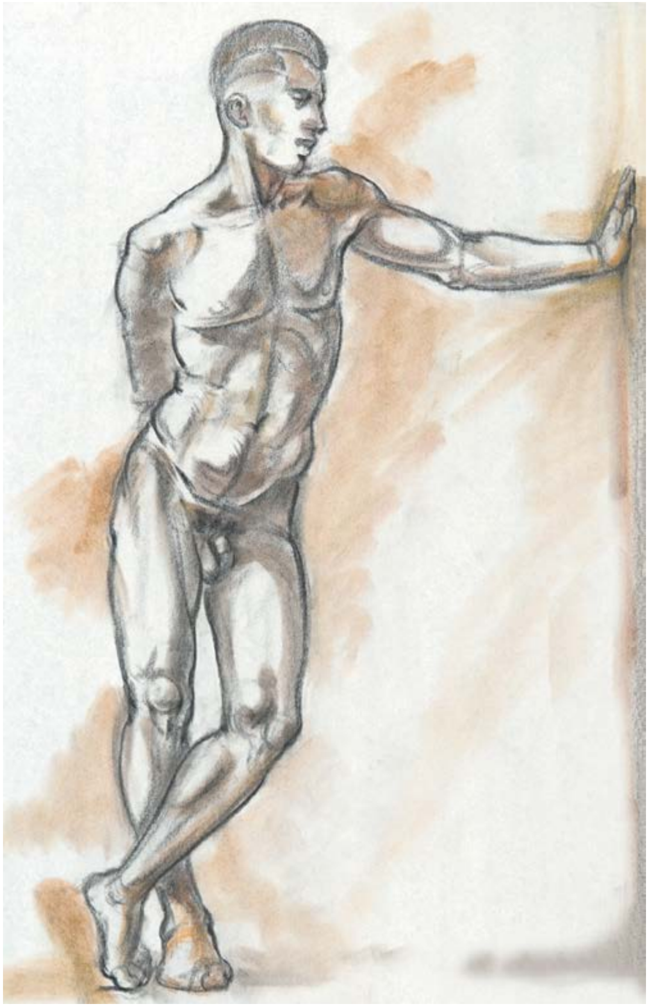
The drawing also shows the central axes of the upper and lower limbs. Note that these axes do not indicate the actual positions of the bones but serve only as guides for quickly assessing the general placement of the limbs in different poses. The central axis of the upper arm starts near the shoulder joint or higher up, near the acromion process or the outer end of the clavicle, and it ends near the elbow joint. The axis of the lower arm begins near the elbow joint and ends near the wrist joint. The axis of the upper leg starts near the hip joint (near the anatomical center) and ends on the knee joint. The axis of the lower leg begins at the knee joint and ends near the ankle joint. The hands, fingers, feet, and toes likewise have their own central axes (not shown in the drawing).



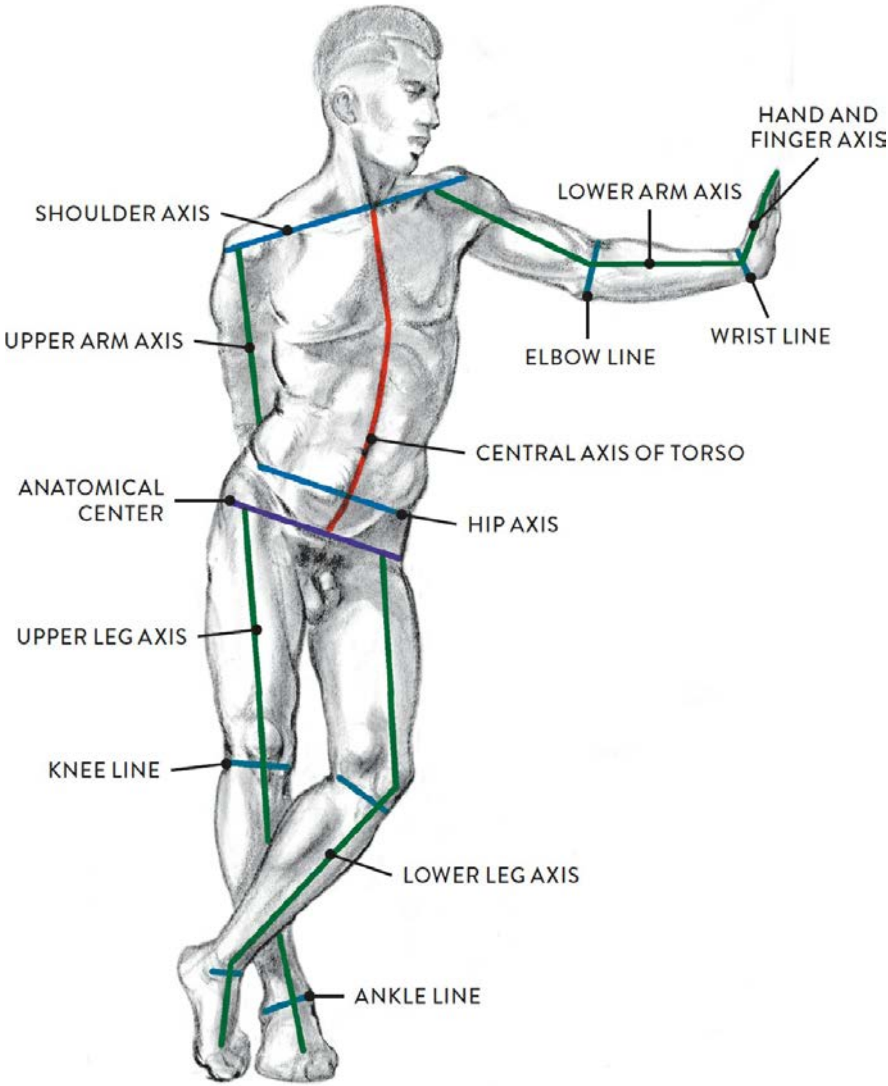
Anterior (left) and posterior (right) view

The figure in the life study *Standing Male Figure Resting His Hand on a Wall*, is executing a very classical, somewhat passive pose, yet there are various angles throughout. The main action is seen in the serpentine movement through the torso and the supporting leg. The axes of the shoulder and hip angle in different directions and also contrast with the various angles of the limbs. The accompanying structural diagram shows the various axes and their angles.

STANDING MALE FIGURE RESTING HIS HAND ON A WALL



Black Conté crayon and sanguine pastel dust on white paper.


HAND AND FINGER AXIS
LOWER ARM AXIS
SHOULDER AXIS
UPPER ARM AXIS
ELBOW LINE
WRIST LINE
CENTRAL AXIS OF TORSO
ANATOMICAL CENTER
HIP AXIS
UPPER LEG AXIS
KNEE LINE
LOWER LEG AXIS
ANKLE LINE

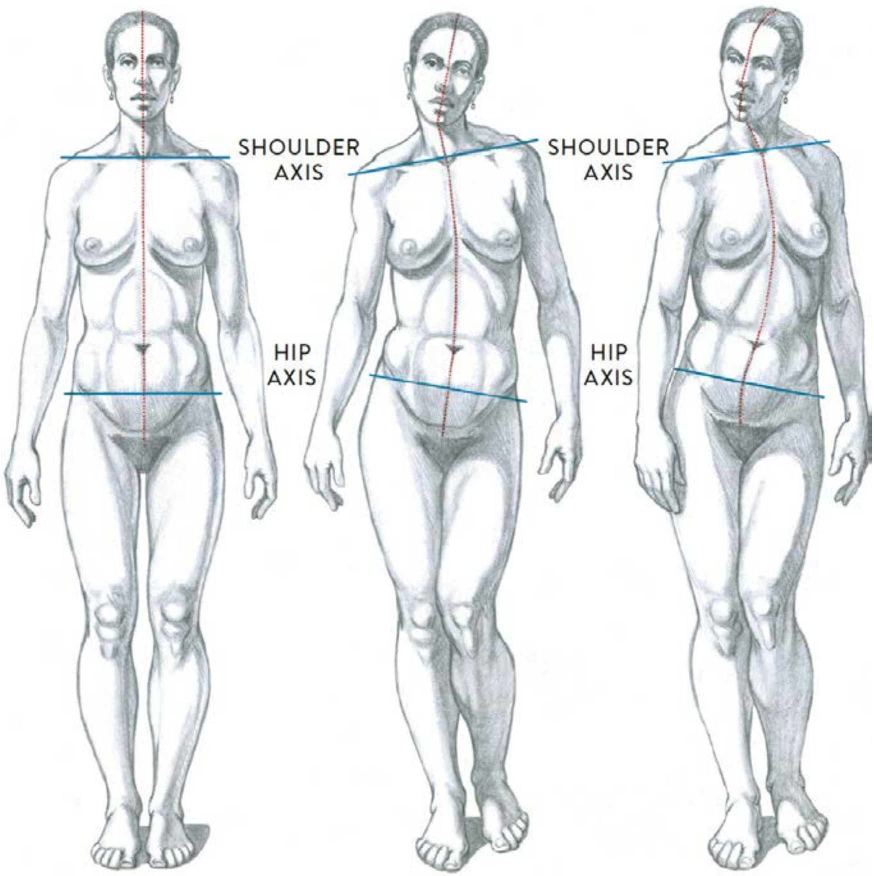
Finding Movement in Standing Poses: Contrapposto

Contrapposto is an Italian term that can be translated as "counterpoise," "counterpose," or "counterposition." It is primarily used to describe a classical standing pose in which the figure's weight is concentrated on one leg while the other knee is bent, creating a tilt in the pelvis. The foot of the bending leg can be flat on the ground, or the heel can be lifted while the ball of the foot remains anchored to the ground. The hip bone on the side of the straighter leg is higher than that of the bent leg, producing a counterbalancing reaction in the shoulder axis, which tilts slightly in opposition to the hip axis. Variations on this pose can be seen in figurative art of the past two thousand–plus years.

Here, we will look at two kinds of contrapposto: *traditional contrapposto,* which is somewhat passive in nature, and *dynamic contrapposto,* in which there is a twisting action in the torso. Both kinds are shown—and compared to a neutral standing pose—in these drawings.

CONTRAPPOSTO POSES—TRADITIONAL AND DYNAMIC

Anterior view

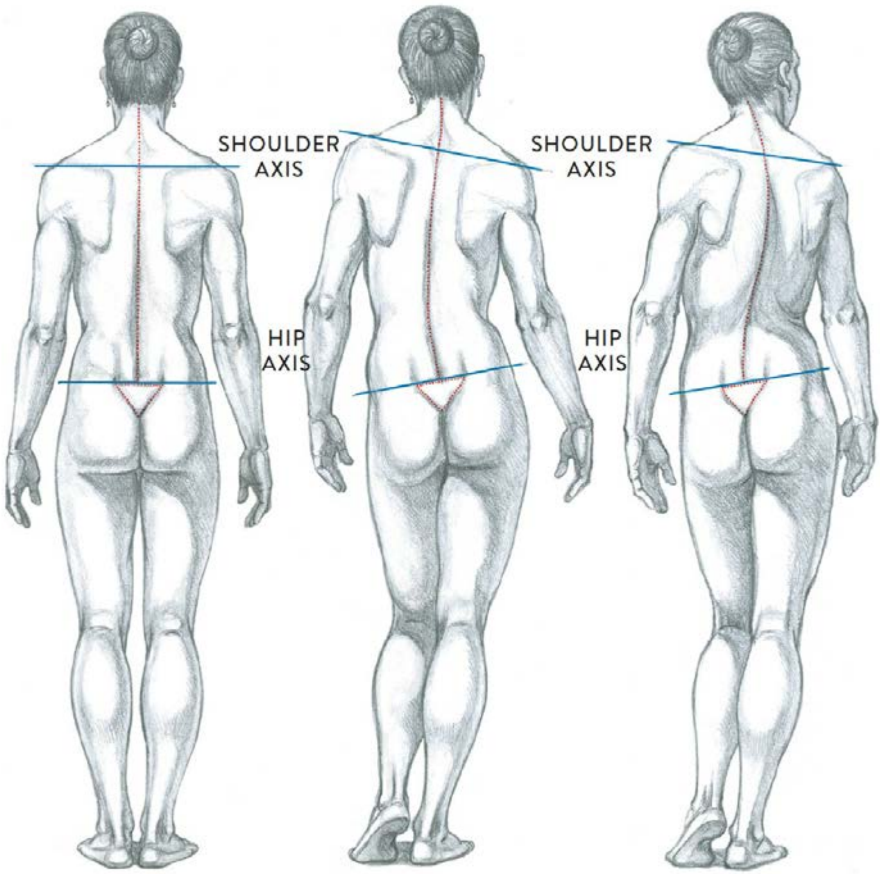


LEFT: Neutral standing position

CENTER: Traditional contrapposto

RIGHT: Dynamic contrapposto with twisting action

Posterior view



LEFT: Neutral standing position

CENTER: Traditional contrapposto

RIGHT: Dynamic contrapposto with twisting action

Traditional Contrapposto

The traditional contrapposto pose, also known as *classical contrapposto,* was probably first employed by classical Greek sculptors who broke away from the symmetrical standing poses of ancient Egyptian, Mesopotamian, and archaic Greek statuary. By shifting the figure's weight to one leg, they created a lyrical curving alignment in the

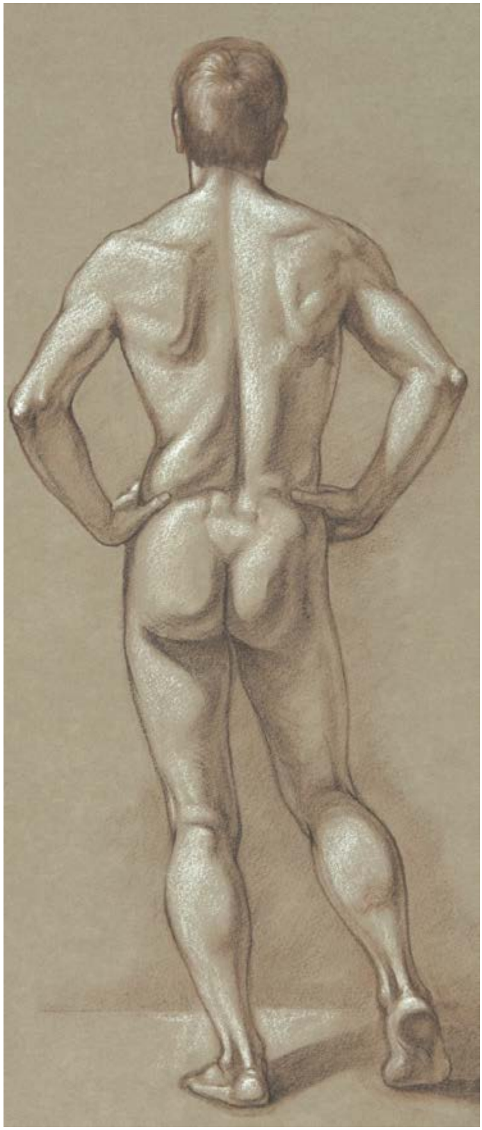
torso that often continues through the weight-bearing leg. A gentle S-shape can be seen curving between the pit of the neck and the pubic bone in front views and along the vertebral column in back views. When it continues through the supporting leg, it gives the whole pose a sense of flowing motion. Artists of the Renaissance also employed the pose, as did Neoclassical artists of the late eighteenth and early nineteenth centuries and Academic artists of the nineteenth century. Even today, it appears in the work of artists working in a classical realist mode.

Traditionally, most depictions of classical contrapposto show a frontal plane on both the rib cage and pelvis structures. Even though the rib cage and hips are tilting in different directions, the planes of the torso face forward and are not rotating or turning to any degree. Of course, the same applies when observing the figure from the back.

The placement of the arms in a contrapposto pose can vary. Some poses have the arms raised upward, with the hands resting on or near the head or neck. Other poses have the arms bent at the elbows, with the hands placed on the hips (arms akimbo). And in others the arms are held near the torso in various graceful positions.

The figure in the life study *Back View of Male Figure in a Traditional Contrapposto Pose, with Arms Akimbo,* is taking the classic contrapposto stance, with the weight on one leg while the other leg is bent at the knee. This creates a tilting action in the pelvis with a slight counterbalancing action in the shoulders. The bent arms almost make the pose appear symmetrical, yet you can see the subtle, lyrical curve of the midline along the vertebral column.

BACK VIEW OF MALE FIGURE IN A TRADITIONAL CONTRAPPOSTO POSE, WITH ARMS AKIMBO



Brown pastel pencils and white chalk on toned paper.

Dynamic Contrapposto

In the dynamic contrapposto pose, the rib cage tilts at one angle while the pelvis tilts in

opposition—just as in traditional contrapposto. The difference is that, in the dynamic version of the pose, both the rib cage and pelvis twist or rotate away from each other, giving the midline of the torso more tension and movement and creating an obvious serpentine curve of the midline on the front of the torso or along the vertebral column.

This more dynamic version of contrapposto—also called *baroque contrapposto* or *spiraling contrapposto*—is found in many figurative paintings and sculptures of the late Rennaissance and the Mannerist periods, but most notably in works of the Baroque period (seventeenth century).

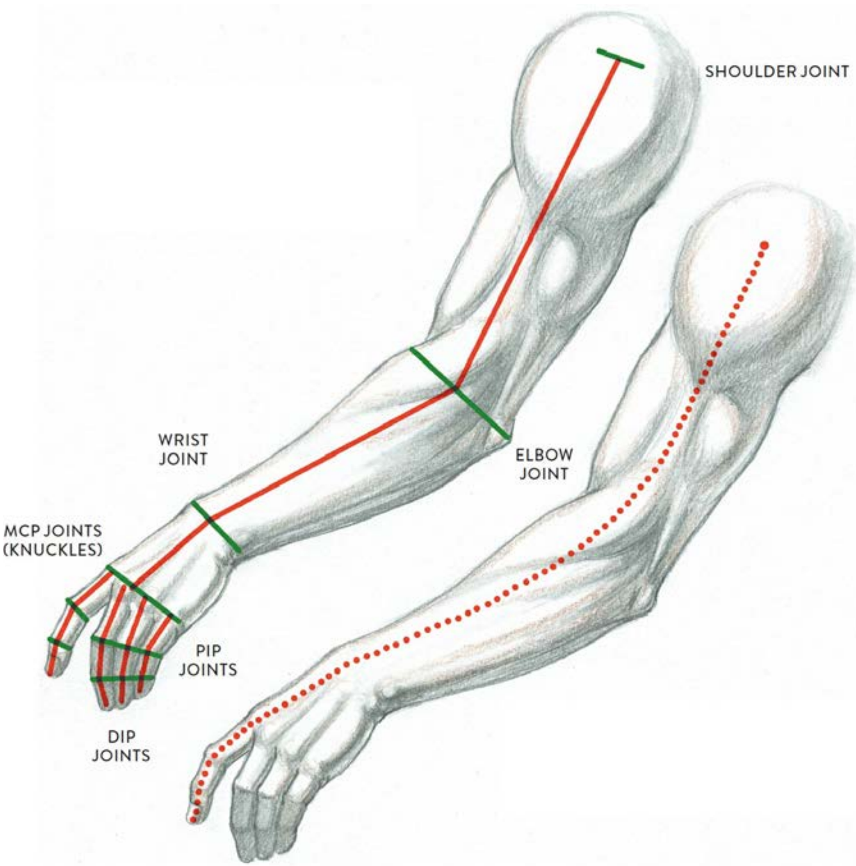
As in traditional contrapposto, the arms can be placed in a variety of positions. But the head can also tilt or swivel, altering the dynamics of the overall pose. In the life study *Female Figure in a Dynamic Contrapposto Pose Holding a Staff,* the turning head and the placement of the arms help convey the energy of the twisting action.

FEMALE FIGURE IN A DYNAMIC CONTRAPPOSTO POSE HOLDING A STAFF

Graphite pencil, watercolor wash, and white chalk on toned paper.

Finding Movement in Various Poses: Line of Action

Line of action generally means the directional movement of the whole figure within a pose, but it can also pertain to an individual body part (a limb, the torso, the head), which may have its own line of action. The line of action is similar to the central axis but is more organic; at times, the line of action does not precisely follow the central axis of the body or a body component, instead indicating a more sweeping alignment within the pose. You can see this in the drawing below: Instead of tracing the angular relations between the central axes of the upper arm, lower arm, hand, and fingers, the line of action indicates a continuous, organic movement beginning at the shoulder and carried through to the wrist, hand, and index finger. Locating the line of action is especially important in quick gesture studies, but it can also be useful when doing longer studies, to emphasize a fluid quality throughout the forms.



Left arm, lateral view

TOP: The central axis is the actual alignment of a body component, usually running from joint to joint.

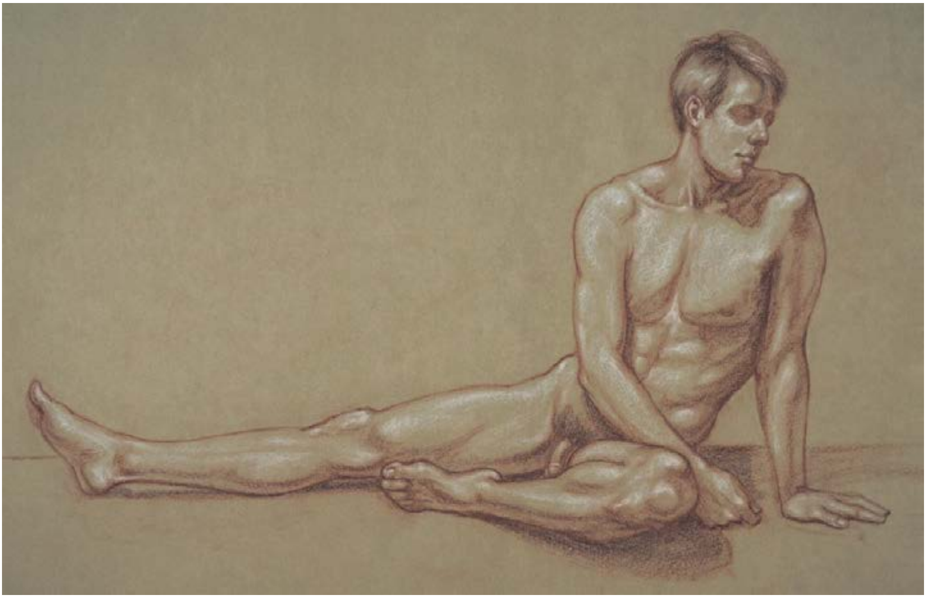
BOTTOM: The line of action is a continuous line moving throughout the forms, connecting the body components in one sweeping alignment.

Note that *line of action* does not mean the same thing as *path of action.* The line of action is a directional line describing the action within a single stationary pose, whereas the path of action is the pathway of a figure executing a sequential movement.

The life study *Male Figure Resting on Floor,* shows a strong main line of action. It more or less follows the central axis of the head and torso—though not exactly—and then flows downward and outward in a more general, organic way. The movement can

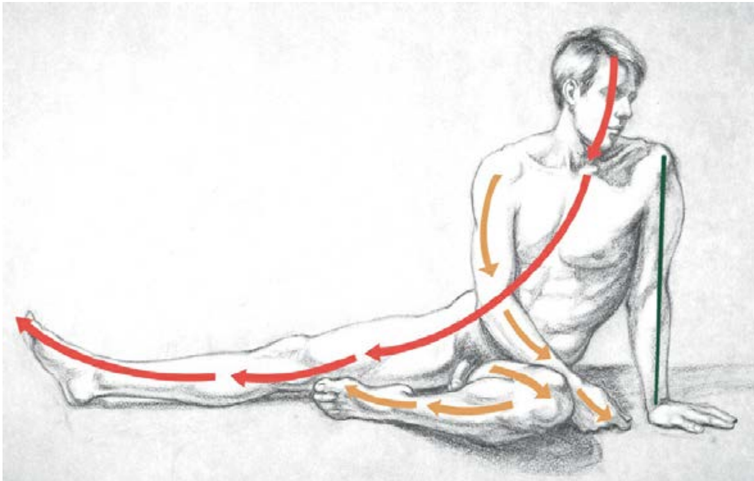
be slightly exaggerated to produce a more dynamic action in an otherwise static pose. In the accompanying diagram, the main line of action is indicated with red arrows and secondary lines of action are indicated with yellow arrows. The support of this whole pose is made possible by the left arm; otherwise, the figure would topple over. The green line going through the left arm indicates this important support.

MALE FIGURE RESTING ON FLOOR



Sanguine and brown pastel pencils with white chalk on toned paper.

LINE OF ACTION DIAGRAM



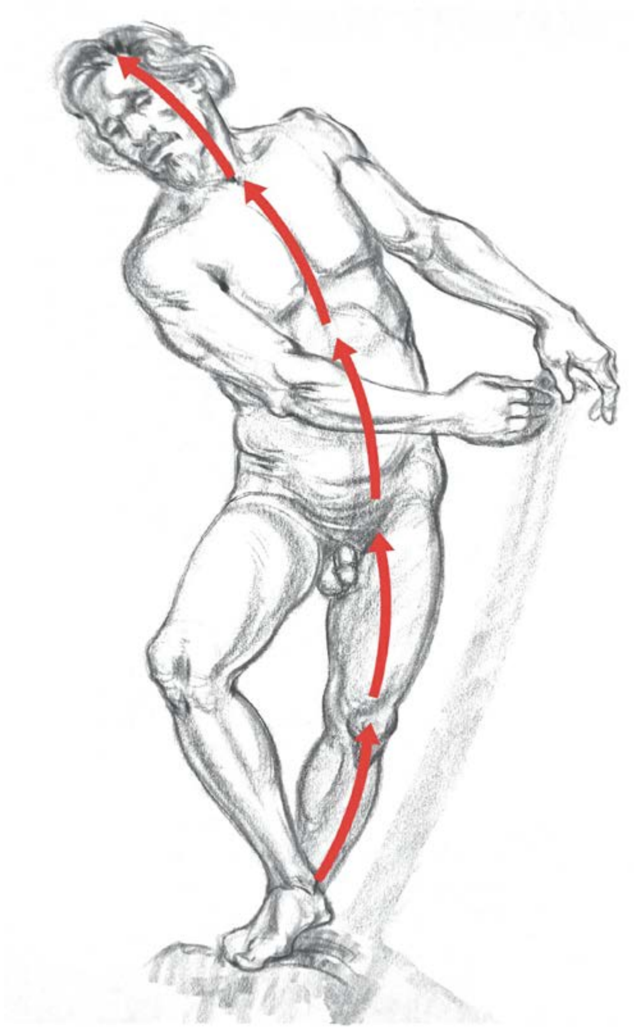
RED ARROWS: Main line of action
YELLOW ARROWS: Main twisting action of torso
GREEN LINE: Diagonal within pose

In the life study *Male Figure in a Dynamic Standing Pose,* the figure is leaning precariously to one side, creating a dynamic curving movement in the overall pose. The line of action begins from the supporting leg, going all the way through the torso and head. The figure is almost out of balance, but the suggestion of a staff keeps the figure from appearing to topple over. The red arrows in the accompanying diagram show the pathway of the line of action.

MALE FIGURE IN A DYNAMIC STANDING POSE

Black Conté crayon and sanguine pastel pencil on newsprint.

LINE OF ACTION DIAGRAM

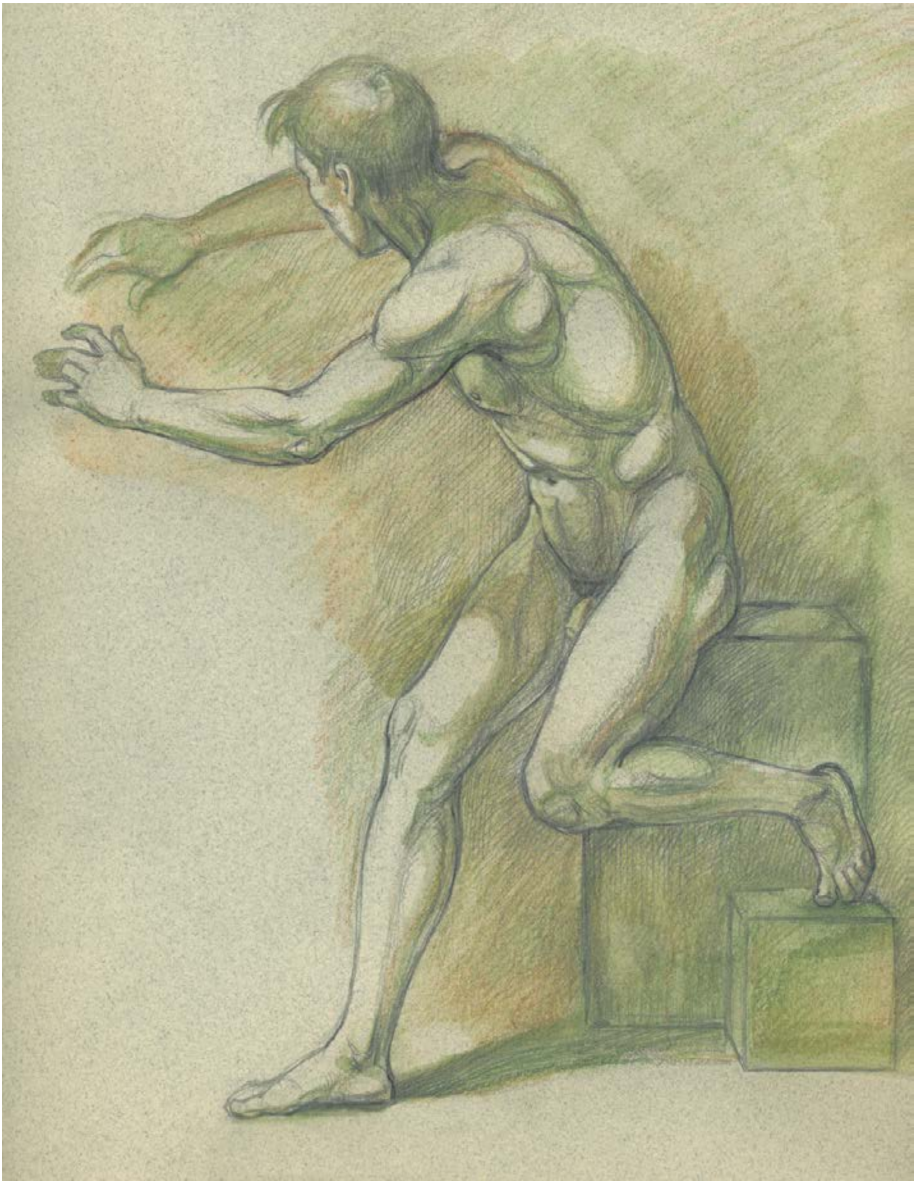


RED ARROWS: Main line of action

The next life study, *Twisting Male Figure,* below, shows a tremendous amount of twisting in the torso unit. The figure is leaning, and the limbs are tilting in different directions. Each body section (head, torso, and limbs) has its own line of action, but these different tilts and angles can be connected to create a sense of continuous rhythm or

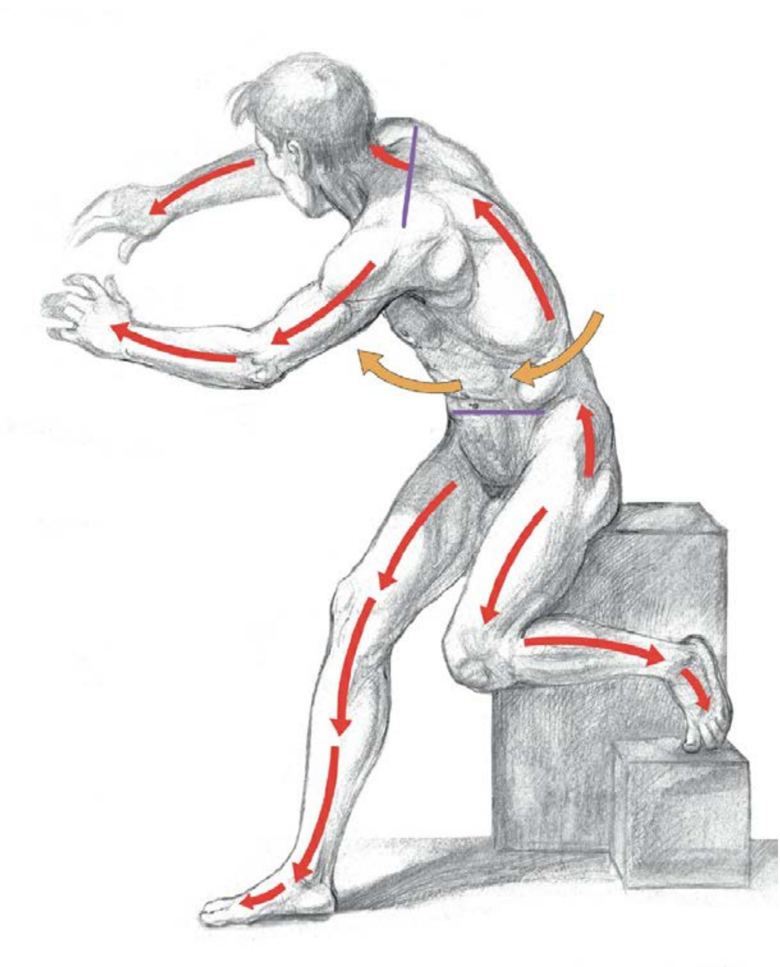
movement throughout the pose. In the accompanying diagram, the red arrows show the main lines of action; the yellow arrows indicate the extreme twisting action in the torso; and the purple lines show the placement of the shoulder and hip axes.

TWISTING MALE FIGURE



Graphite pencil, watercolor pencils, and ballpoint pen on light toned paper.

LINE OF ACTION DIAGRAM



RED ARROWS: Main line of action
YELLOW ARROWS: Secondary lines of action
PURPLE LINES: Shoulder and hip axes

Finding Movement in Diagonal Poses

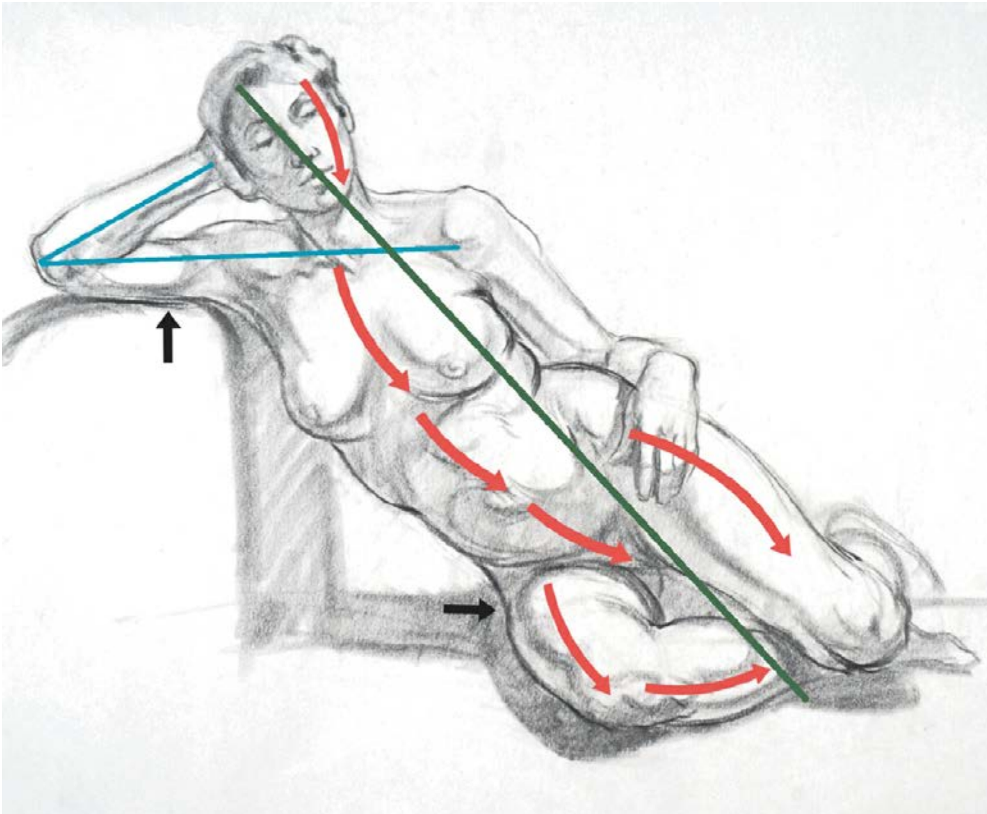
Poses that have an obvious diagonal alignment already contain a strong sense of one-directional movement. In longer poses, it is essential to indicate how far the figure is actually leaning and whether the figure is being supported; otherwise, the figure may appear to be toppling over. A strong diagonal in a drawing can be too strong, sweeping the viewer's eye right off the page. If that's the case, you must look for ways to counterbalance the diagonal. One way is to find an indication of rhythm in the anatomical forms or to look for other diagonals or angles that play in opposition to the main diagonal. Sometimes a twisting action in the torso and head region can counter an aggressive diagonal.

In the life study *Female Figure Resting at a Diagonal,* the figure is leaning on some sort of structure for support, which helps balance the figure. Tones and shadows help anchor the figure to the ground surface. The red arrows in the accompanying diagram show the subtly curving anatomical forms. Emphasizing the movement in the torso and legs helps counteract the intensity of the strong angle of the entire pose, shown by the green line.

FEMALE FIGURE RESTING AT A DIAGONAL

Black Conté crayon on white paper.

DIAGRAM OF DIAGONAL, RHYTHM, AND SUPPORT ACTIONS



RED ARROWS: Rhythmic movement within pose
BLUE LINES: Horizontal shoulder line and support angle of lower right arm
BLACK ARROWS: Pressure points for support
GREEN LINE: Diagonal within pose

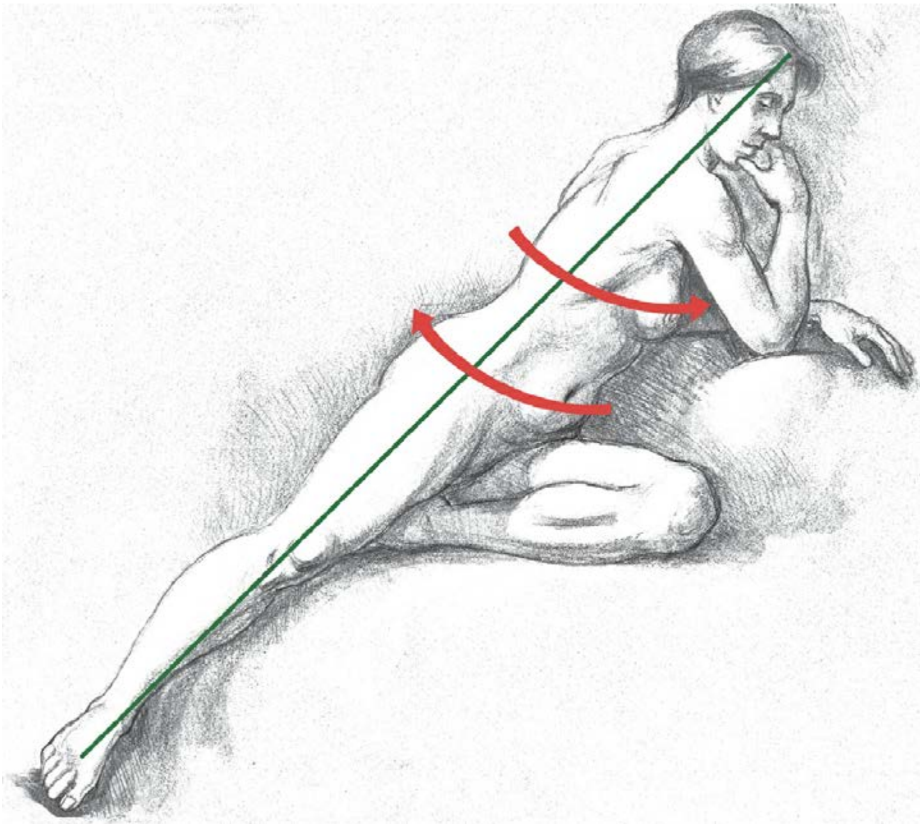
In the life study *Female Figure in a Diagonal Pose,* the main line of action is an exceedingly strong diagonal. Again, the figure has many supports to maintain the sense of balance: support for the right arm at the elbow and the left arm, support for the hips and left leg, and the floor to support the right foot. What is interesting in this pose is the subtle twisting action in the torso region. The rib cage is twisting away from the viewer (you can see part of the model's back up near her shoulders), while the pelvis is positioned sideways but twisting slightly toward the viewer. As you visually travel

down the right leg, you can see that it twists toward the front. Even though these twisting actions of the torso and right leg are subtle, they help counteract the dynamic tilt of the overall pose. The accompanying diagram shows the strongly diagonal main line of action in the pose and, perpendicular to that alignment, the twisting action in the torso.

FEMALE FIGURE IN A DIAGONAL POSE

Graphite pencil, watercolor pencil, and white chalk on toned paper.

DIAGRAM OF DIAGONAL AND TWISTING ACTIONS



GREEN LINE: Diagonal within pose
RED ARROWS: Opposite twisting action in rib cage and pelvis

STUDY OF A SITTING FIGURE LEANING FORWARD

Graphite pencil, ballpoint pen, watercolor wash, and white chalk on toned paper.

Chapter 12

Rhythmic Movement

In the last chapter we investigated how to convey a sense of movement in the stationary figure by locating the line of action within a pose. Now we will continue that exploration by finding *rhythms* within a pose that can give continuity to the various elements—lines, forms, shapes, lights, tones—in a drawing, painting, or sculpture.

Essentially, the idea is to adjust, or "tweak," the lines, forms, shapes, lights, or shadows to emphasize a directional movement within the pose and, by doing so, to lead the eye along a certain pathway through the figure and its environment. This visual pathway can be angular or flowing and lyrical. Orchestrating the surface forms in a cohesive manner creates a feeling of interconnection throughout the composition; if this rhythmic connection is not achieved, the forms of the figure may appear disconnected and static.

Rhythm can be detected along the contours of forms as well as in the placement of forms. Infusing a sense of rhythm within the forms is similar to creating music—introducing a visual "beat" or "tempo" within a figural composition. Short lines are like rapid syncopated beats, similar to a *staccato* passage in music. Elongated, curving lines are like a smooth and lyrical *legato* passage. Methodical meandering of the forms is comparable to *adagio,* while vigorous, dynamic strokes and tones produce a *vivace* effect—animated, brisk, and lively.

To convey a rhythmic pulse within a drawing, find three or more repetitive shapes interweaving in alternating patterns throughout the forms of the figure. These might form a pattern of fluctuating, interconnecting arcs or of serpentine "S" lines traveling through the figure. Keep in mind that not every region of the figure needs to express a sense of rhythmic movement. Areas in which there is no sensation of stretching, compression, or tension should be kept neutral. To continue the musical analogy, these neutral areas can be thought of as "rests"—pauses or intervals of silence. If there are no visual pauses between forms, the drawing might become "noisy"—saturated with too many bulges and bumps clumped together in a seemingly haphazard fashion.

Shorter gesture poses offer you the chance to embellish the play of rhythm in the forms, because an exaggerated sense of movement is the essence of such studies. For longer studies, however, try not to distort the forms too much, even though some tweaking is necessary to create a particular kind of movement in your drawing.

Establishing a strong sense of the figure's internal structure will help you avoid unwanted distortion by providing a firm, reliable support for the energetic quality of the forms.

When looking at a pose, ask yourself which elements seem to possess a rhythmic quality. Is an obvious contour in one location echoed in another? Is there an escalating crescendo of lights on the forms? Are there areas in which similar kinds of stretching, compression, or twisting are occurring? Emphasizing these elements and using a strategy for connecting them can create an overall sense of graceful unity or dynamic tension.

The direction of the rhythm greatly depends on the pose of the model and where the light source is, which together determine how the lights and tones are positioned. Look for *straight line movements* that emphasize vertical, horizontal, or diagonal directions. *Curving* or *spiral movements* can give a continuous, fluid sense of motion on the surface of the figure as well as in the background space of the drawing. *Shape movements* can be detected when geometric or organic shapes (for instance, pear shapes or kidney-bean shapes) are repeated throughout a figure. You might also detect *counter-movements,* which are secondary movements countering the main overall movement.

Let the energy and character of the pose help you select which areas to focus on. Keep in mind that different poses inspire different interpretations of movement: Some might be dynamic and intense, while others will be gentle and low key. There is no right or wrong way to apply these ideas. It is really a matter of *your* interpretation of the pose—your choice regarding which elements to emphasize to create a sensation of motion. Sometimes intuition plays a great part in this process.

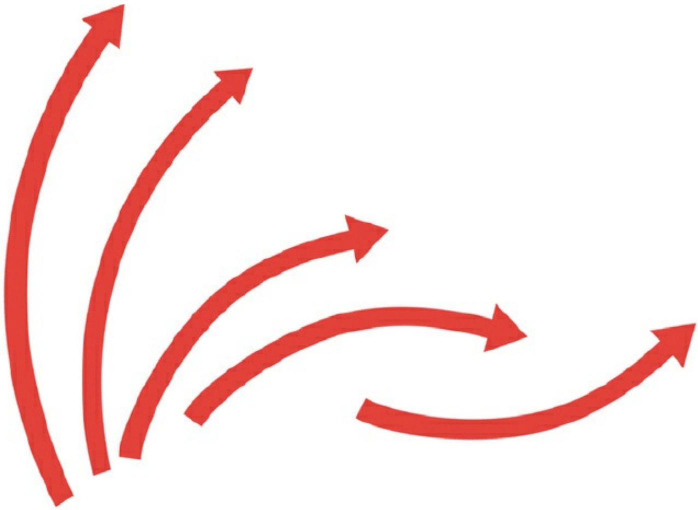
In what follows, we'll look at four different kinds of visual rhythm: *rhythm of line, rhythm of form, rhythm of shapes,* and *rhythm of lights and tones.* In a given drawing, you may want to use just one of these or two or more in combination. You may emphasize the rhythms strongly or merely suggest them—it's up to you. But the desired outcome is always a sensation of energy flowing in, around, and through the forms of the figure and the surrounding pictorial space.

Rhythm of Line

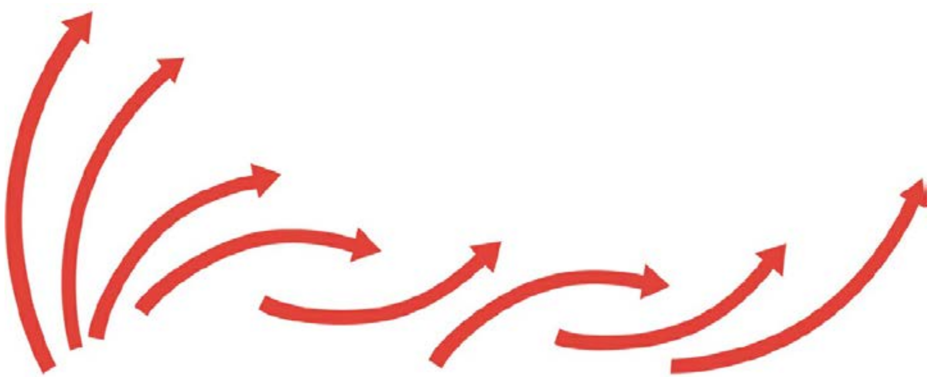
Rhythm of line is the accentuation of selected *contour lines* of a figure study to induce a quality of movement. As you set up your drawing of the figure, search for an obvious curvature in any area on the figure (such as one side of a hip) and see if this curve is echoed in another, nearby part of the figure. Do these two curving lines relate to each other in a continuous motion? If they do, you might need to tweak them to make that connection more obvious. Continue to search for similar curves in the figure, connecting them in a subtle or dynamic manner. What you're doing is intentionally altering the contour lines to enhance the rhythmic connection.

When working with rhythm of line in a drawing, the quality of your line work itself is important. A "calligraphic" line—one that varies from thick to thin and has lighter and darker values—might work well. So might different lengths of line (short and long) or combinations of aggressive and passive lines, straight and curving lines, or crisp and blurred edges. Any of these can be used, depending on the length of the pose, the medium, and your intention for the drawing.

This simple diagram shows how lines—symbolized by arrows—can have a directional flow indicating a pulsating rhythm.



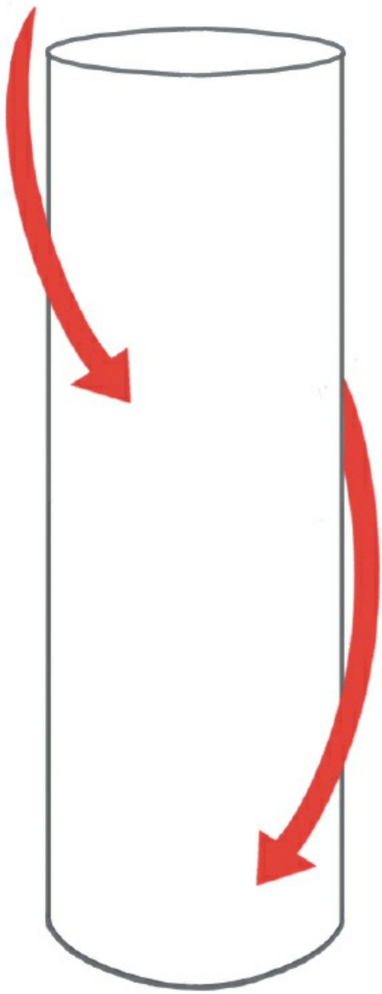
Rhythm of line



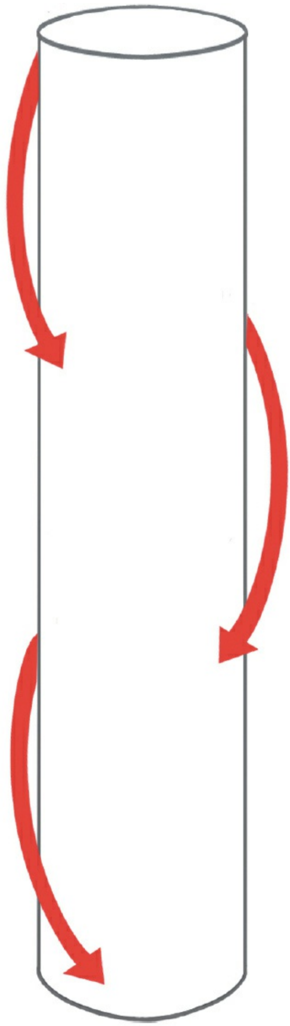
Rhythm of line extended, with continuous movement

The diagram *Rhythm of Line on a Cylinder,* shows two cylinders, each of which might represent an arm, leg, or even a whole standing figure. The curving arrows symbolize the contour line wrapping around the structure in rhythmic arcs.

RHYTHM OF LINE ON A CYLINDER



Rhythm of line on a cylinder, showing two sweeping arcs



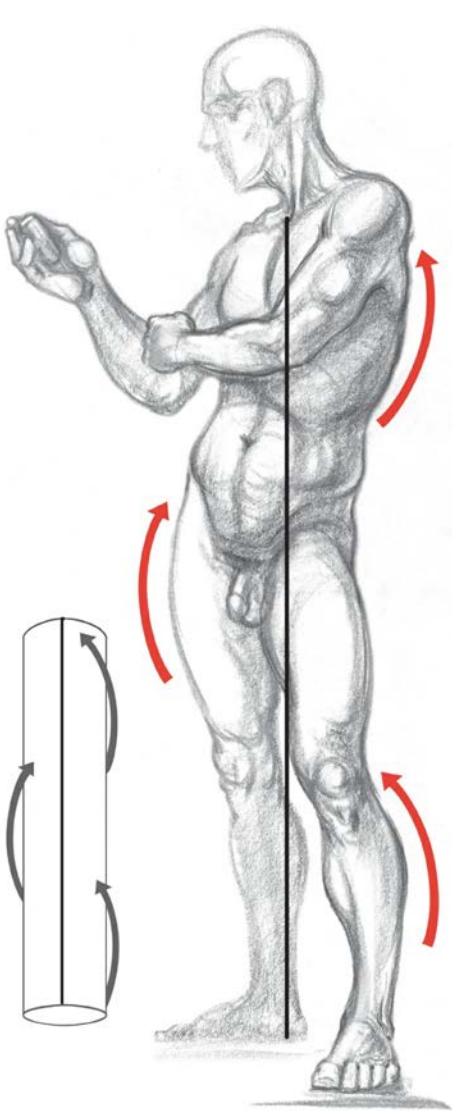
Rhythm of line on an elongated cylinder, showing three sweeping arcs

In the life study *Standing Figure Texting,* you can see a sweeping play of exaggerated contours moving through the vertical figure. This kind of action, whether subtle or dynamic, helps prevent a standing pose from looking too static. The accompanying diagram shows the basic rhythm.

STANDING FIGURE TEXTING

Sanguine and black Conté crayon on newsprint.

RHYTHM OF LINE DIAGRAM

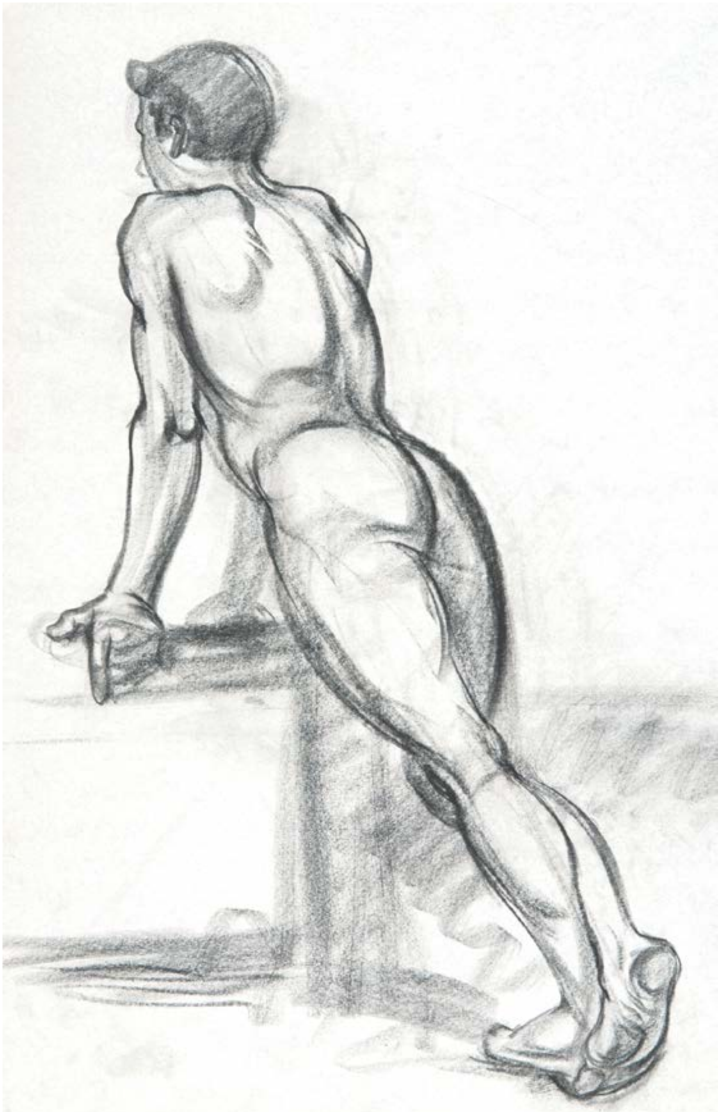


LEFT: Cylinder showing rhythm of line

RIGHT: Rhythm of line in figure study

In the five-minute drawing *Figure Leaning Forward on a Ledge,* the figure is leaning in a strong diagonal. Selected contour lines are heavily accentuated to induce a feeling of

rhythmic movement throughout the pose.



Black Conté crayon on white paper.

In the five-minute gesture drawing *Seated Female Figure Looking Downward,* the emphasis is mainly on the contours; the rhythm is enhanced by the line work's calligraphic quality, alternating thicker and thinner lines and darker and lighter values.

SEATED FEMALE FIGURE LOOKING DOWNWARD

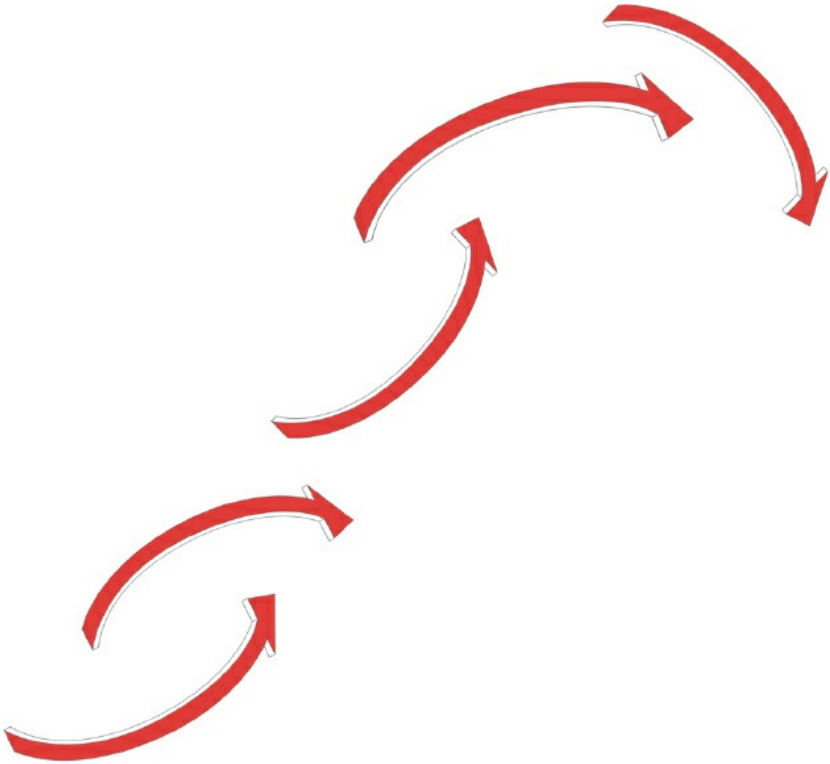
Black Conté crayon on white paper.

Rhythm of Forms

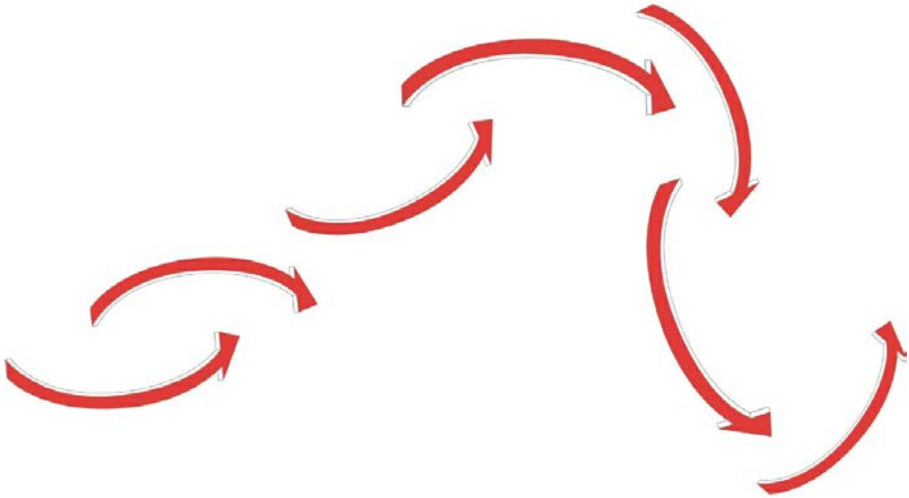
Rhythm of forms is the accentuation of muscular and soft-tissue forms to indicate movement working its way *across* and *around* the figure. It can be combined with rhythm of line to rhythmically connect any series of overlapping forms. When one form (muscle or soft tissue) slightly overlaps another, and then that second form overlaps yet another, the forms can appear as a series of "stepping stones," leading the eye in and around the whole figure. Indicating overlapping forms gives the surface of the figure a feeling of three-dimensionality and is especially important in foreshortened views. When using rhythm of form, it's often a good idea to start your line or tone at the outer edge of a form (the contour) and then take it in an oblique direction across the figure, where it might connect with another line or tone surrounding a different form. The emphasis should stay on the forms themselves, with the lines, tones, and lights playing supporting roles. These same principles can be applied to the folds of fabric when working with a draped, partly clothed, or clothed model.

The following diagram shows three-dimensional arrows moving in a spiraling rhythm. (These examples are only two of the countless ways you might set up the pathways of rhythmic movement.) Spiraling rhythms can be seen especially clearly in very dynamic twisting poses.

RHYTHM OF FORMS—SPIRALING MOVEMENT



Escalating three-dimensional arrows indicating a spiraling movement with a rise, fall, and recovery ascent



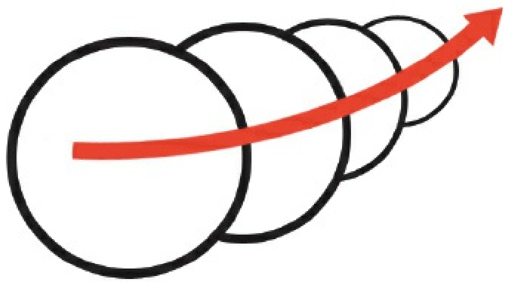
Escalating three-dimensional arrows indicating rhythmic spiraling movement

The energy created within the forms can also move past the figure, swirling around it and probing into the pictorial space. Conveying a sensation of spiraling movement is a good choice if the figure is positioned in a setting with a foreground, middle ground, and background. It also works well when there are several figures in a composition. In the study *Seated Female Figure with Rhythmic Forms,* the forms of the figure are surrounded with tones that continue into the background, providing a sense of rhythmic energy.

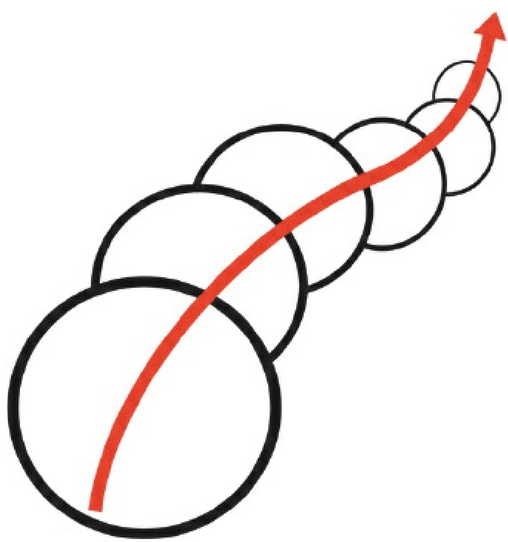
SEATED FEMALE FIGURE WITH RHYTHMIC FORMS

Graphite pencil, ballpoint pen, and watercolor pencil on white paper.

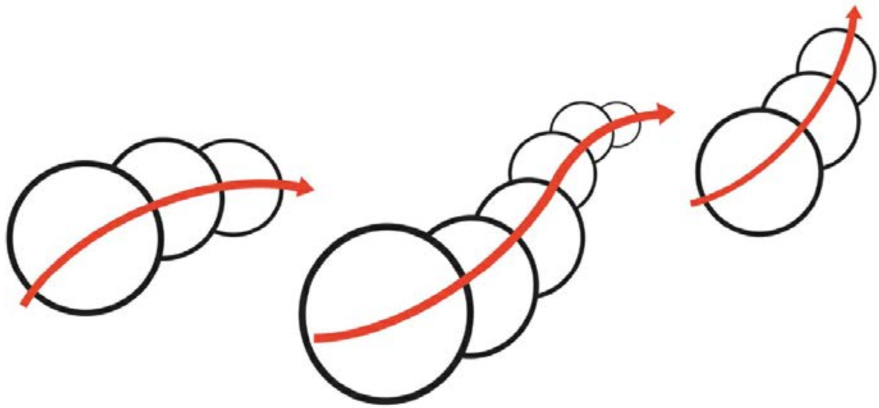
In the next diagram, overlapping spheres in various arrangements indicate a feeling of rhythmic movement. This approach is especially useful in foreshortened views, as, for example, when a torso or leg travels back into the pictorial space. The overlapping of forms can also be applied to small groups of forms, such as the toes or fingertips.



Overlapping spheres showing “stepping stone” arrangement indicating depth



Overlapping spheres indicating a serpentine movement

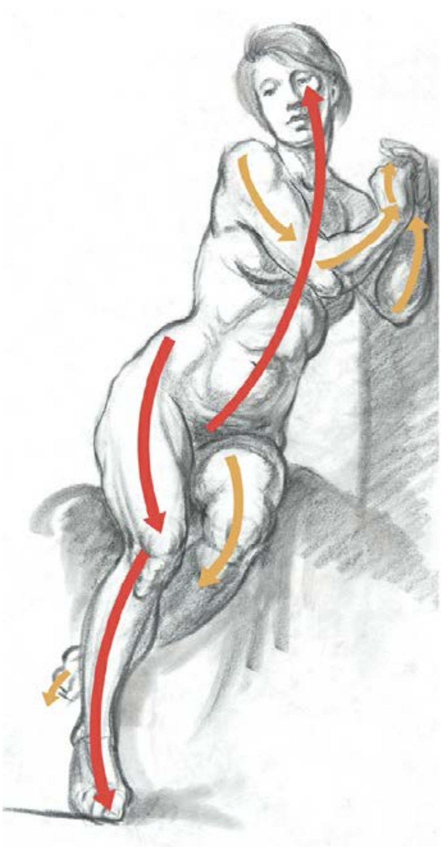


Cluster of overlapping spheres showing interconnection of rhythm

In the life study *Seated Female Figure Leaning against a Wall,* the whole pose embodies a sense of lyrical rhythmic movement. The two accompanying diagrams show how the rhythm of forms was analyzed. In the first, red arrows indicate the dynamic, serpentine line of action; counter-movements in the arms and the right leg are represented by yellow arrows. In the second diagram, red contour lines represent the rhythmic forms and curving alignments within the pose.

SEATED FEMALE FIGURE LEANING AGAINST A WALL

Black Conté crayon on white paper.



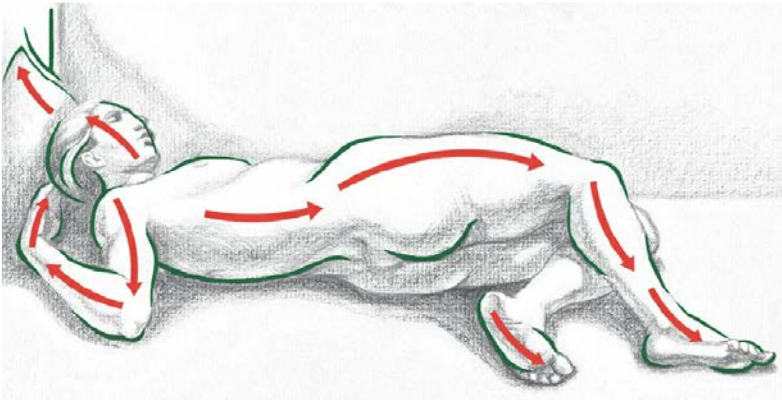
RED ARROWS: Primary lines of action
YELLOW ARROWS: Counter-movements
RED CONTOUR LINES: Rhythm of forms

In the life study *Horizontally Reclining Female Figure,* shown next, the reclining figure is twisting dynamically. The lights and tones on the forms accentuate the rhythmic movement. In the accompanying diagram, the red arrows represent the primary lines of action and the green lines that move along the outer edges of the forms indicate a play of rhythm along the contours.

HORIZONTALLY RECLINING FEMALE FIGURE

Graphite pencil, colored pencil, and white chalk on toned paper.

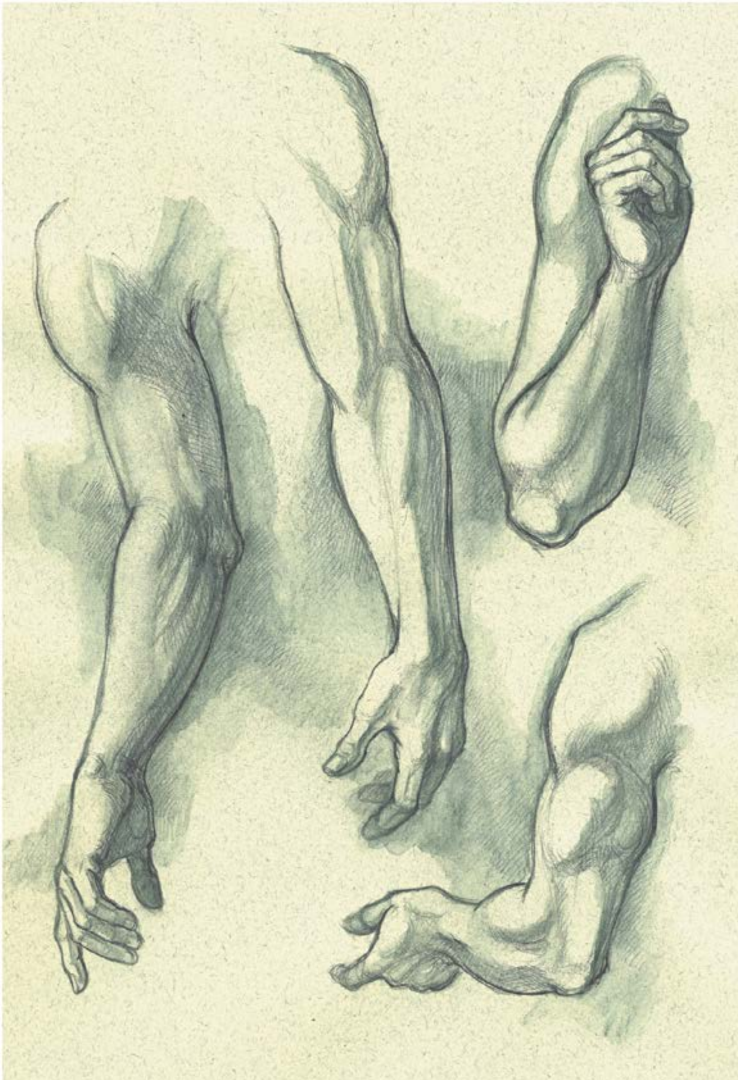
RHYTHM OF FORMS DIAGRAM



RED ARROWS: Primary lines of action
GREEN LINES: Rhythm of outer edges (contours), indicating rhythm of forms

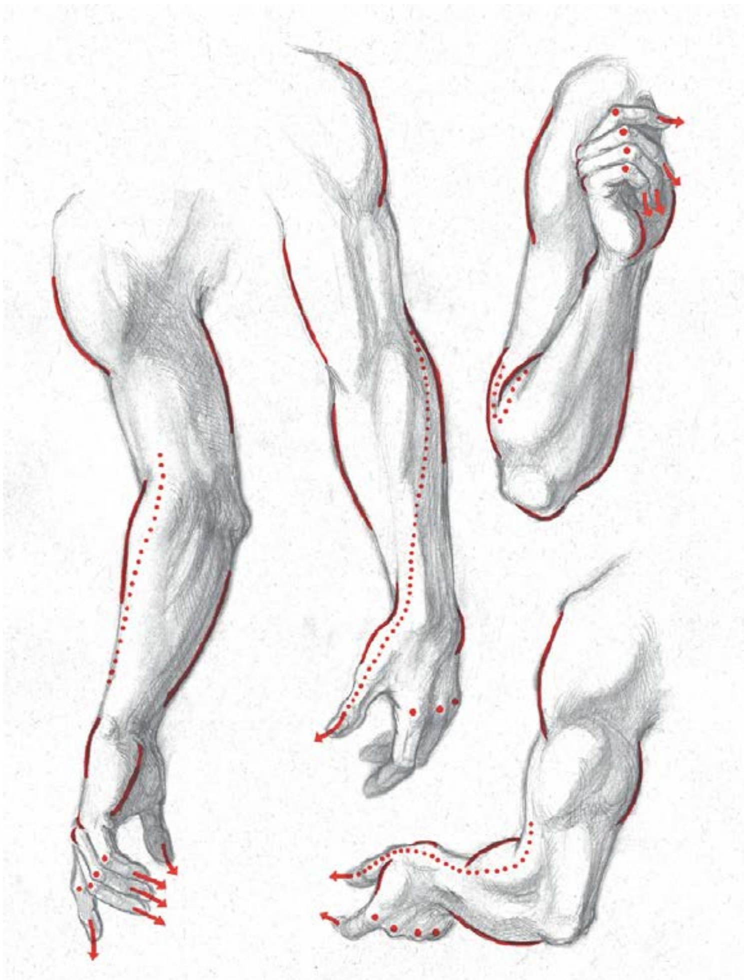
In *Study of Four Arms in Different Positions,* shown next, a rhythmic quality is established by emphasizing the tones and selected contour lines. In the accompanying diagram, the rhythm of forms is indicated by the red lines; the red dots and red arrows continue the direction of movement.

STUDY OF FOUR ARMS IN DIFFERENT POSITIONS



Graphite pencil, ballpoint pen, and ink wash on light toned paper.

RHYTHM OF FORMS DIAGRAM



RED LINES: Rhythmic contours RED ARROWS: Rhythmic direction of fingers SMALL RED DOTS: Rhythmic direction of forearm muscles spiraling on lower arm LARGE RED DOTS: Rhythm of knuckles

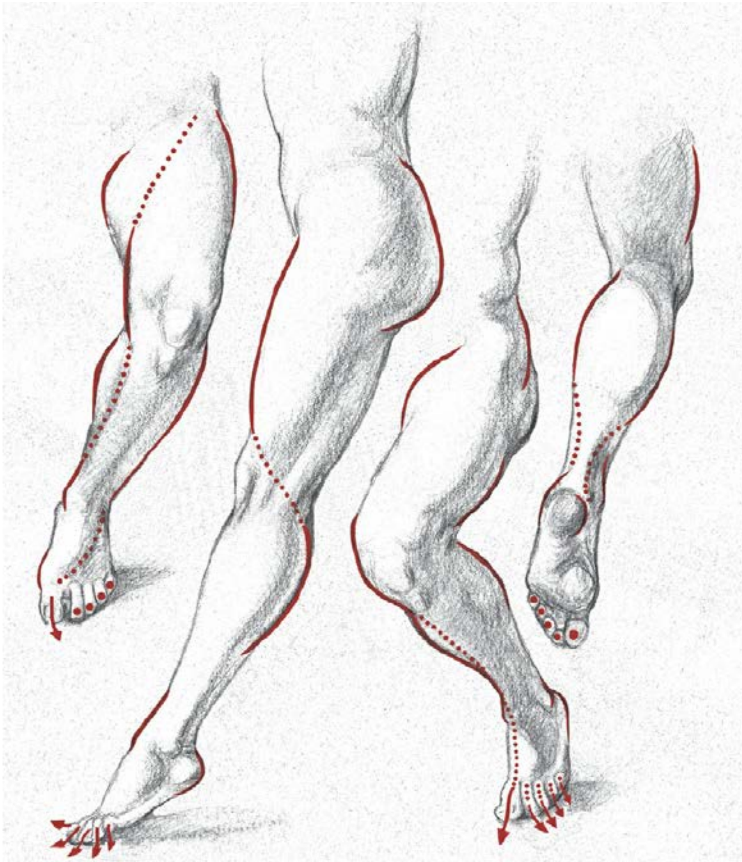
Study of Legs in Different Positions, on the following page, shows the rich muscular shapes in four positions of the legs and feet. In the accompanying diagram, the rhythm of forms is indicated by red lines; the red dots and red arrows continue the direction of

movement.

STUDY OF LEGS IN DIFFERENT POSITIONS

Graphite pencil, watercolor wash, white chalk on toned paper.

RHYTHM OF FORMS DIAGRAM



RED LINES: Rhythmic contours
RED DOTS: Direction of movement continued across forms
RED ARROWS: Rhythm of toes

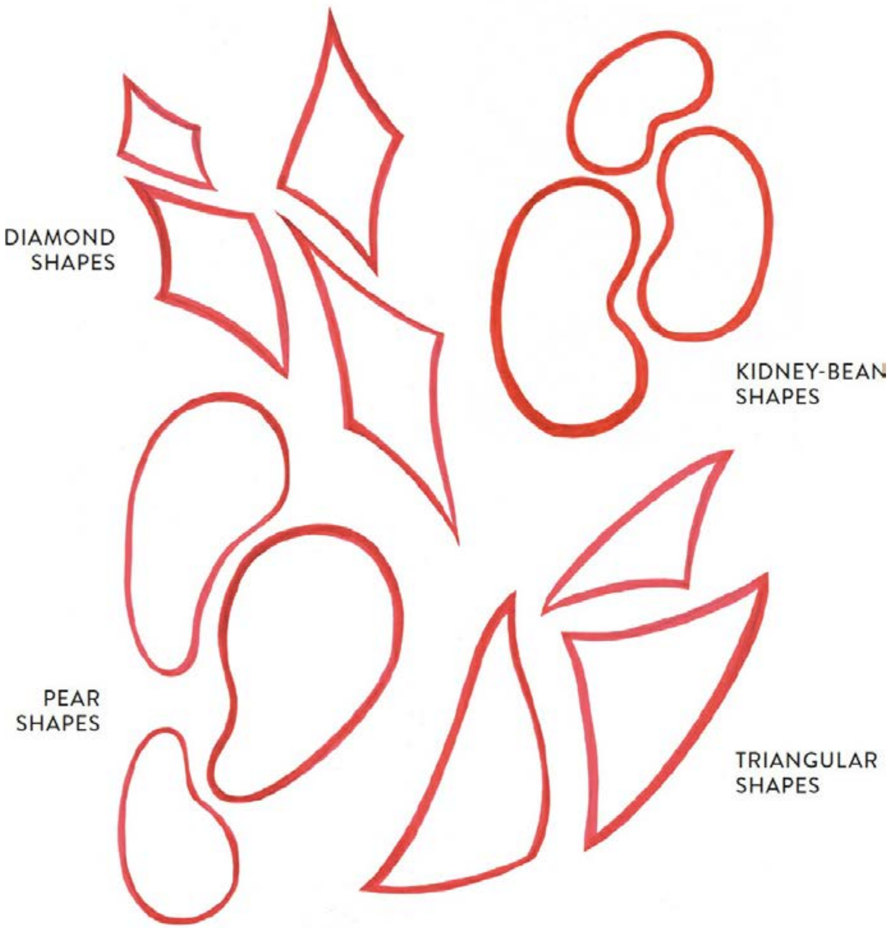
Rhythm of Shapes

Rhythm of shapes is similar to rhythm of forms. The difference is that I'm using the term *form* to describe a three-dimensional mass and the term *shape* to denote a two-dimensional, or flat, configuration. When searching for rhythm of shapes, you're looking for organic or geometric shapes that recur in the figure's forms and perhaps also in the configurations of light and shadow. They might also be seen in the folds of drapery. A shape must be visible in at least three locations on the figure to establish a sense of connected movement.

Depending on the pose and the way the light is hitting the model, you may notice organic or geometric shapes arranged in a loose, asymmetrical manner: pear shapes, ovals, kidney-bean shapes, triangles, diamonds, wedge shapes, or other free-form or angular shapes. If you want to introduce a theme of organic or geometric shapes in a drawing, select related forms and echo their shapes throughout the figure and background. But be careful: Too many unrelated shapes, or shapes that are emphasized too greatly, will give the drawing a chaotic feeling.

The following diagram shows examples of such organic and geometric shapes—pear shapes, kidney-bean shapes, triangles, and diamonds. Of course, these are only a few of the many possible shapes that may be seen in a pose.

RHYTHM OF ORGANIC AND GEOMETRIC SHAPES

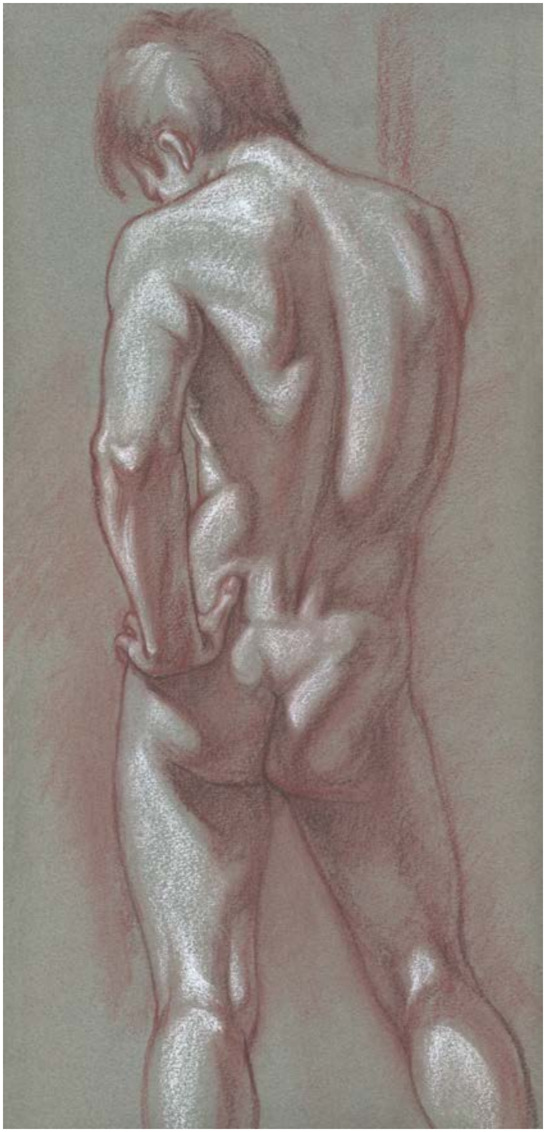


The life study *Standing Female Figure with Right Arm Extended Sideways,* below, is a quick gesture study in which the serpentine movement of the overall pose plays against the distinctly angular quality of the arms. I emphasized organic shapes in the forms and lights to create a flowing directional movement throughout the pose.

Black Conté crayon and pastel on newsprint.

The theme of repeated triangular shapes in the lights and shadows of *Male Figure in a Posterior View, with Left Hand on Hip,* below, underscores the sense of movement throughout the forms.

MALE FIGURE IN A POSTERIOR VIEW, WITH LEFT HAND ON HIP



Sanguine pastel pencils and white chalk on toned paper.

Rhythm of Lights and Tones

The sensation of rhythm can also be indicated by the lights and tones (shadows) on the figure and the pictorial space surrounding the figure.

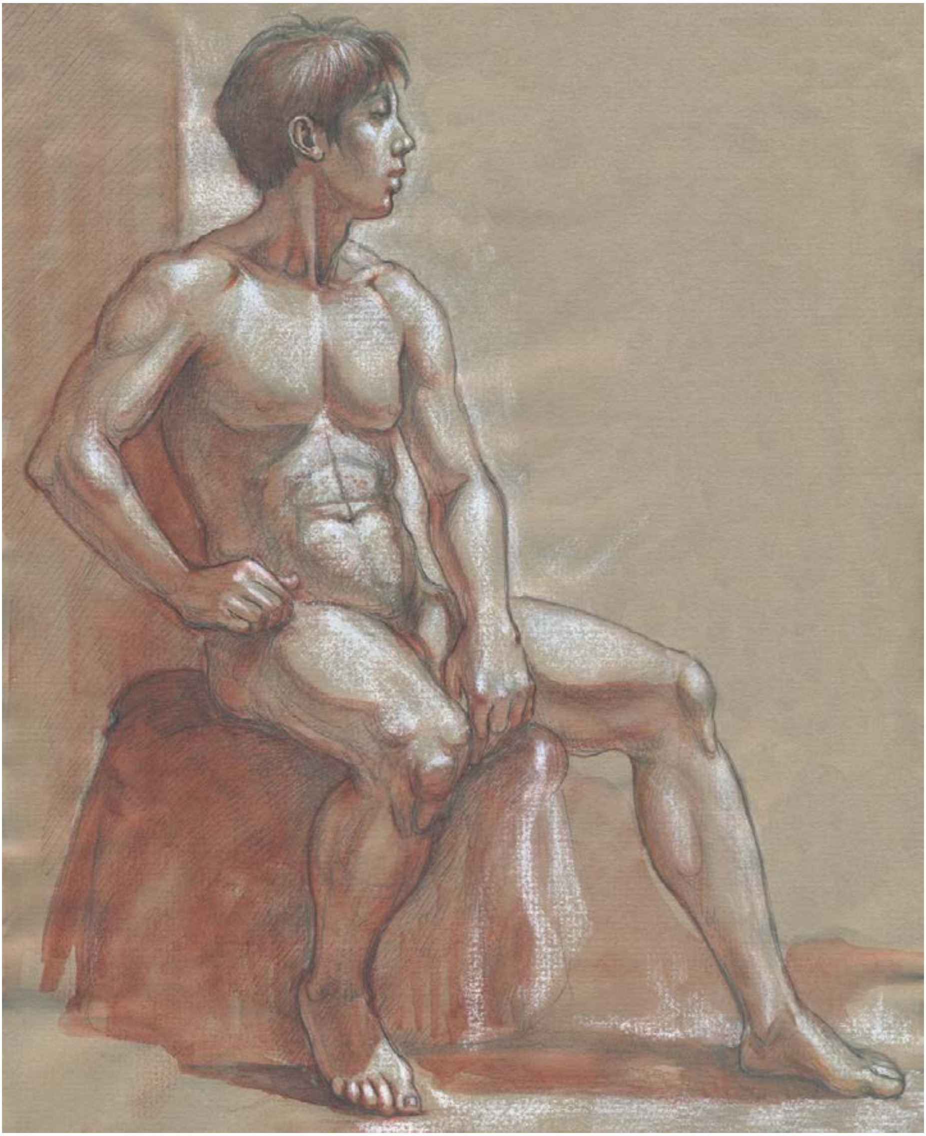
Rhythm of lights is a lyrical arrangement of lights and highlights. There are a number of techniques for applying rhythmic lights, but they can be dramatically emphasized when you use white chalk or a light-value colored pencil on toned paper. Remember to leave some “breathing room,” using subtle gradations of mid-tones between the lightest passages. These neutral intervals or pauses are equivalent to rests in musical notation.

The pattern of lights can continue into areas surrounding the figure—drapery, the floor, or background objects. This shaping of the lights can be subtle, not deviating too much from observed reality, or it can be exaggerated, producing pronounced organic shapes that appear to dance across the forms. Other elements, such as tones and lines, may be important in the drawing, but the lights are key to instilling the sense of movement.

Rhythm of tones is the intentional shaping of tones and shadows to indicate movement. In traditional drawing, forms are given the illusion of three-dimensionality through two types of shadows: *Form shadows* usually have soft edges, with an indication of a *core* (a slightly darker value along the edge of the form shadow). *Cast shadows* usually have harder, crisper edges. (One way to remember the difference between form shadows and cast shadows is to think of cast shadows as being “cast away” from a form, as when a shadow moves away from the feet standing on the floor or the shadow of a breast moves away from it on the surface of the torso.) When implementing rhythm of tones, you can still have these differing edge qualities, but you also have the freedom to tweak the tones, moving them in and around the forms or continuing them outside the figure and into the background.

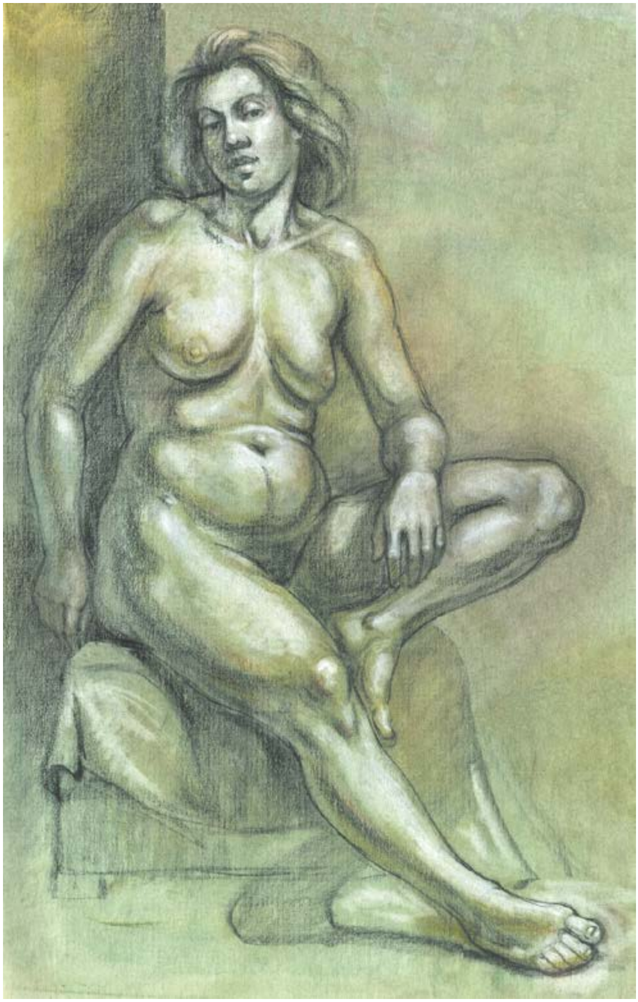
In the drawings shown next, rhythms of lights and tones are applied to induce a feeling of movement not only in the figure but also in the pictorial space surrounding it. To underscore the impression that the figures are occupying actual physical space, I included suggestions of the supporting structures they are sitting or reclining upon. Indications of shadows cast by the bodies anchor them to their surroundings.

MALE FIGURE SITTING



Graphite pencil, ballpoint pen, sanguine chalk, watercolor wash, and white chalk on toned paper.

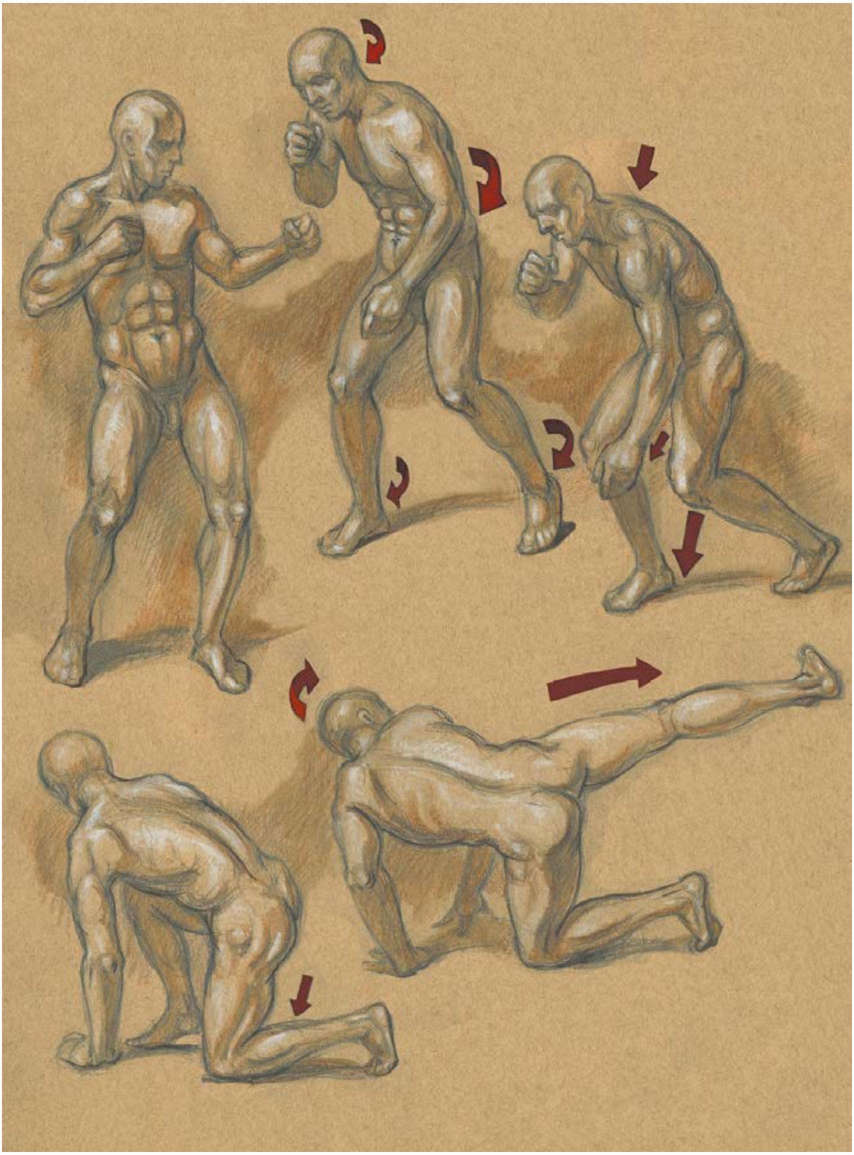
FEMALE FIGURE SITTING NONCHALANTLY



Black Conté crayon, black charcoal pencil, and white chalk on white paper covered in pastel dust.

STUDY FOR A LOW-RELIEF SCULPTURE OF A RECLINING FIGURE

Black, sanguine, and brown Conté crayon (whites lifted with eraser) on white paper smeared with charcoal and sanguine pastel dust.



SEQUENTIAL MOVEMENT OF A KICKBOXING FIGURE

Graphite pencil, ballpoint pen, watercolor pencil, white chalk, and red marker on toned paper.

Chapter 13
Sequential Movement

The human figure can move in an infinite number of ways—from the most ordinary movement, such as walking up a flight of stairs, to a powerful twisting action, as when a soccer player leaps to kick a ball through the air. The body can instantly maneuver from one position to another in an elegant, flowing manner or can execute multiple movements in succession at various speeds and tempos. This choreography of the muscular and skeletal systems makes the depiction of movement challenging, whether an artist is creating animated figures or "freeze-framing" a body in motion.

The term *sequential movement* describes a figure or body section going through a series of changing positions. The mechanics of movement depend on many factors, including muscle dynamics, joint action, shifting of weight, changes in a figure's center of gravity, and the influence of gravity on the moving figure. Animators work with an even longer list of factors—timing, tempo changes, slower and faster acceleration, body language, facial expressions, and vocalizations—and must have a deeper understanding of the laws of physics as they apply to figures in motion.

In previous chapters, we looked at how to infuse a stationary pose with movement by observing how body structures turn, tilt, tip, and twist and by applying a rhythmic quality throughout the forms. Now we will examine, in a simplified way, how the body changes in actual movement and how to depict that action. The exercises here are not genuine animation procedures. They are meant to serve only as simple guides to help figurative artists in all genres to strengthen their skill in recognizing joint and muscle movement and to improve their ability to depict it. For those who need more in-depth knowledge, I recommend getting solid training from expert animators or digital artists—either through books or online tutorials or, better, in person at an art or design school.

Mechanics of the Gait Cycle

Let's start by looking at the mechanics of the *gait cycle* for both walking and running. These two gaits have some similarities but also some differences. A basic understanding of walking and running gait cycles will help you as you do more complex sequential studies depicting actions from sports like soccer, basketball, and tennis.

The Walking Gait Cycle

A walking gait cycle consists of two steps: a right step and a left step, which together make up a *stride.* (The terms *gait cycle* and *stride* are synonymous.) Each step can be further broken down into two phases: the *stance phase* and the *swing phase.*

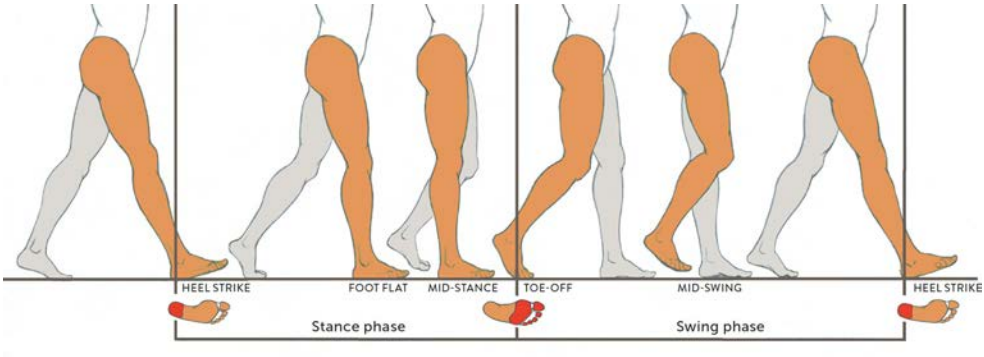
In the stance phase, one leg is bearing the weight of the body and the foot is in contact with the ground. It consists of several stages:

- The *heel strike,* when the heel of the foot first meets the ground
- The *foot flat* stage, when the entire foot is in contact with the ground
- The *mid-stance,* when the leg straightens and the weight of the body is directly positioned over the lower leg
- The *heel-off* stage, when the heel lifts up from the ground
- The *toe-off* stage, when the toes push off the ground, helping propel the foot forward

The swing phase is the portion of the gait cycle when the foot is off the ground and the leg is swinging forward. The swing phase, which begins immediately after the toe-off stage, consists of three stages, and ends with heel striking the ground:

- *Early swing* (or *acceleration*)
- *Mid-swing*
- *Late swing* (or *deceleration*)

When beginning to study the gait cycle, it's easier to focus on just one leg. The following drawing emphasizes the stance and swing phases of the right leg—referred to, technically, as the *right stance phase* and the *right swing phase.* The small footprints show where on the sole of the foot the weight of the body is concentrated during the heel strike and toe-off.

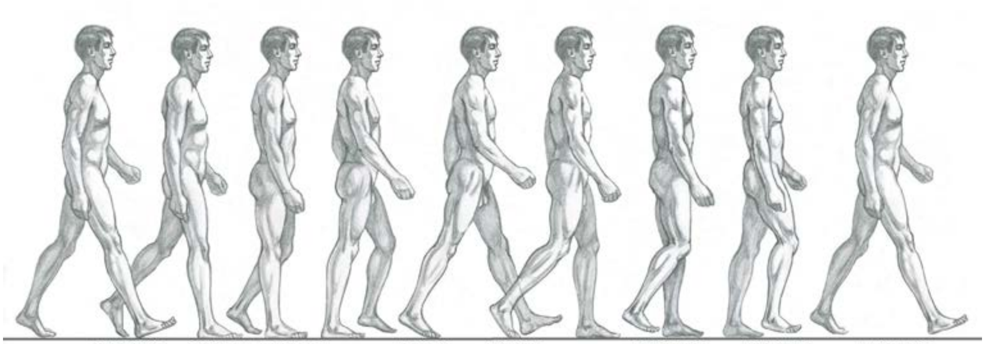


As the right leg moves through the gait cycle, so does the left leg, with the phases in reverse order. At one point during the stride, both feet are touching the ground—a stage known as *double support*. (This does not occur in the running gait cycle.)

The arms tend to swing in opposition to the swing of the legs: When the right leg swings forward, the right arm moves back, and when the left leg swings forward, the left arm moves back. In ordinary walking, arms are generally held in a relaxed position; in a "power walk," however, the arms are intentionally bent at the elbow and pump like pistons during the stride.

The next drawing is a simple study of a basic walking movement. I based this study on a video, pressing the pause button at sequential stages and drawing the figure from these key frames. I roughed in the figures using a basic manikin structure, then replayed the video, adding more visual information.

STUDY OF A WALKING GAIT CYCLE



Focusing on the right leg

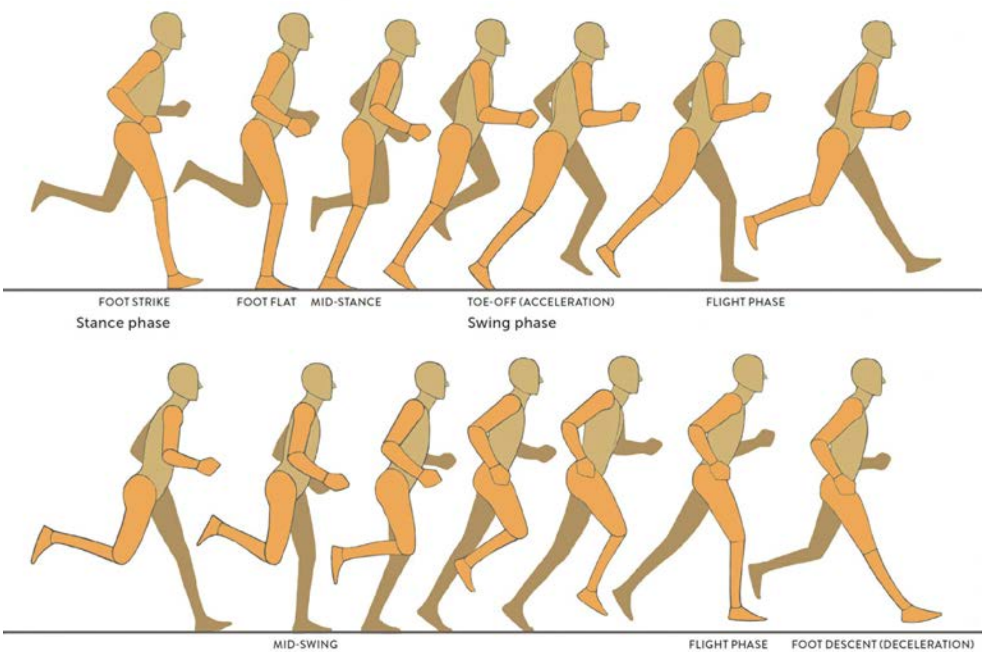
The Running Gait Cycle

Like the walking gait cycle, the running gait cycle has two phases: stance phase and swing phase. One big difference from the walking cycle, however, occurs in the swing phase of the running cycle when at one point both feet are off the ground—the *flight phase* (a subphase within the swing phase).

To practice depicting running, you can study videos of people on treadmills or running along a track and freeze various frames to sketch the basic positions. As you study, you will see subtle differences between different runners. Some people run with their torsos upright, some lean slightly forward, and others—especially sprinters—have a strong diagonal tilt. Runners' arms generally move like pumping pistons, with the elbows held close to the torso, though some people keep their arms more relaxed and loose. Joggers' hands are usually relaxed and slightly cupped, but sprinters generally clench their hands into fists. Some runner-athletes are trained to flex the knee so far that the heel almost hits the glutes ("heel to butt"), while other runners do not lift the foot nearly so dramatically. A runner's foot usually lands on the ball of the foot or the mid-foot, although some runners land on the heel. Strides also vary in length, depending on the individual and the speed of the run: Some runners have strides so long they look like leaps, while others have shorter, more compact strides.

I have purposely kept the running movements depicted here very simple. They're just your first step toward understanding the principles of running—how the figure's weight shifts during the running gait, how the legs and arms alternate, and so on. The following drawing shows a simple breakdown of a manikin figure running one complete gait cycle; the right leg is emphasized. The stance and swing phases are identified, as are the foot

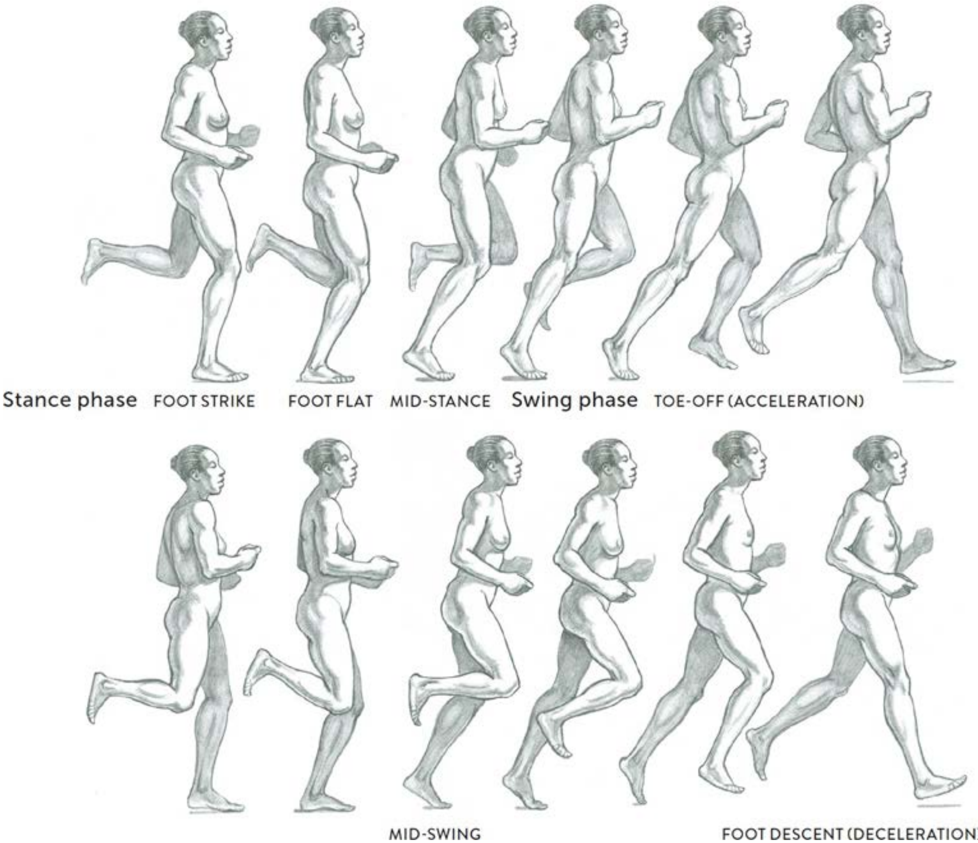
strike, foot flat, mid-stance, toe-off (acceleration), flight, mid-swing, and foot descent (deceleration) stages.



The following drawing is a more compact version of the previous study. The figures are overlapping to show the rhythmic aspect of running. Most noticeable is the rhythm of the head, which reveals that a runner’s head follows a subtly serpentine pathway, not a straight line. When the figure’s feet both leave the ground during the flight stage, the head is positioned higher than when either foot has full contact with the ground.

The next drawing, *Female Figure Jogging,* is a sequential study showing the placement of the basic anatomical forms as the figure runs. As the right foot lands, the outer quadriceps muscle (vastus lateralis) becomes more tense. As the right lower leg stretches in the toe-off stage, the calf muscle (gastrocnemius) becomes more compact.

FEMALE FIGURE JOGGING



Sequential Movement Exercises

There are many ways to study sequential movement. Approaches to drawing a moving figure, summarized in the sidebar below, range from using very raw, gesture-like lines to constructing manikins with geometric shapes to following a more anatomical approach in which you observe and draw the muscular forms changing shape in each key position.

Traditional fine artists can benefit from studying the figure in movement, applying the lessons learned to their depictions of stationary poses. For example, if you study the sequential movement of an arm swinging up over the head from a back view, you will see how the bones of the shoulder girdle change their positions and how the muscles in that same region change shape. Then, when depicting a stationary pose in which a model's arm is positioned over the head, you will have a better understanding of the placement of the shoulder blade (scapula) and of how the deltoid, trapezius, and scapula muscles are stretching in one area and bulging and compressing in another. In other words, you'll see the stationary pose as a kind of *suspended* dynamic action, which will add life and accuracy to your drawing.

Approaches to Drawing Sequential Movement

The following approaches can be used by themselves or combined in any way. Other approaches examined earlier in this book (see especially Chapter 10) can be utilized as well.

Gesture Approach

The gesture approach is the freest and most fun. You can utilize any of the gesture techniques introduced earlier—searching lines, silhouette, organic lines, or contour lines with tones. By choosing the gesture approach, you can capture the dynamic essence of the movement without unnecessary detail. You're free to exaggerate the shapes of the figure to emphasize the directional flow of action from one key position to the next.

Manikin Approach

The manikin approach involves using basic structural shapes to block in the figure in each key position. It's best to draw these manikins very quickly to keep the figures from looking too stiff. Using manikin structures allows you to see when the figure is rotating or twisting or doing any other action that might take place within a sequential movement. This technique works well if you are drawing from photographs or a live model holding each pose in a sequential movement series for at least five minutes. This gives you enough time to capture essential elements, such as the central axis, the shoulder and hip axes, and any twisting or rotation occurring in a position.

Anatomical Approach

For the anatomical approach, you'll need more time. That's easy if you're working from photographs, but if you're working from a live model, the model will have to hold each key position for at least ten minutes for you to be able to render the anatomical forms. Working on toned paper with shadows and lights is great for this

type of anatomical study because it allows you to show the muscle dynamics in great detail.

Exercise #1: Working from Freeze-Framed Video

For this exercise, select a portion of a movement from a DVD or online video and freeze-frame consecutive positions of the figure executing the action, drawing each one. Sports videos showing soccer, basketball, ballet, racquetball, gymnastics, boxing, and tai chi and other martial arts are good sources. In doing the exercise, don't aim for a complete breakdown, as an animator would do when mapping out a character's movement. Instead, distill the movement into its key positions.

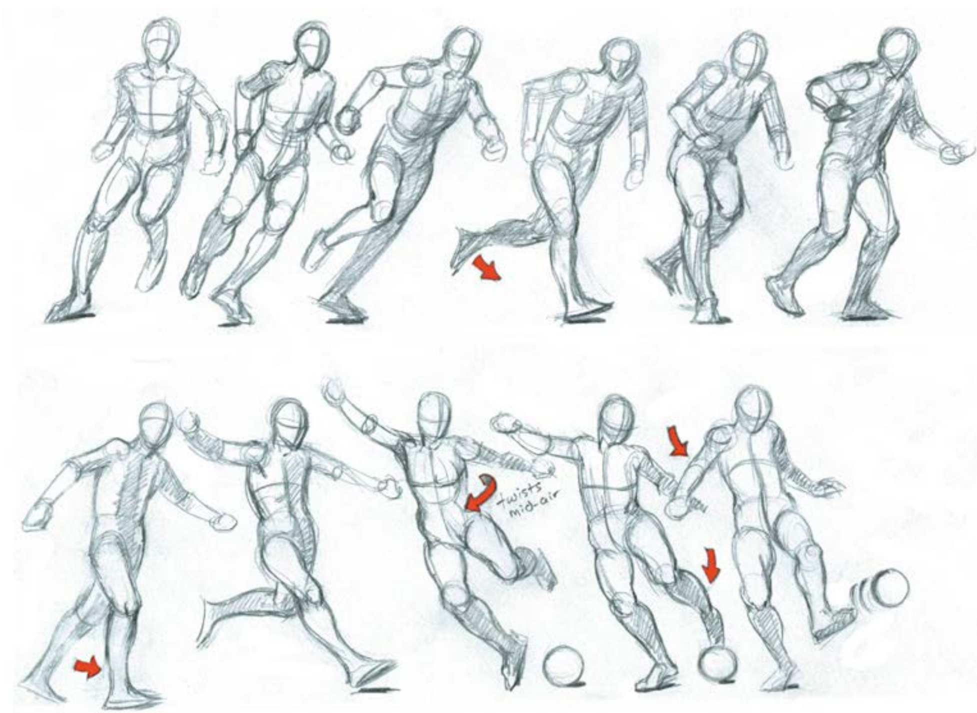
Once you've selected the movement you want to depict, turn off the sound so that you don't get distracted. Then press or click pause to freeze-frame a key position near the start of the action, and do a quick sketch of it (a minute or less). Then move on to the next key position and quickly draw that one. When you have done several of these quick drawings depicting the basic movement, watch the sequence again to observe more closely how the structure of the torso may be twisting and how the limbs are positioned spatially. If you desire, add more information—anatomical forms, surface planes—to the original drawings. To indicate that a leg or arm is receding in space, drop in a quick shadow. The head can be a simple egg shape, with the eye line and central axis indicating any tilting that's occurring within a position. In some drawings, you might want to include arrows or brief notes to document directional changes. You can anchor the figure to the ground by suggesting shadows cast by the figure's feet. If the figure is leaping from the ground, you can indicate a shadow beneath the figure, but there must be a space to suggest that the figure is airborne. Try to create a flowing connection between one position and the next by applying tones behind the figures or connecting the shadows on the ground.

Sometimes, some parts of an action captured on video may be difficult to see, either because the video is not of a high enough resolution and therefore lacks clarity, or clothing is obscuring the figure's structures, or other figures momentarily block the figure you are focused on. Try to ignore these limitations and simply focus on the action as best you can.

One thing that's especially interesting about watching a video of a dynamic action is that you can see the figure momentarily lose balance and then immediately recover. In any dynamic action, there are moments when the figure is precariously off-balance because the figure's center of gravity has moved outside the safety zone of equilibrium. But in a split second a leg will come forward to prevent the figure from falling or the action of an arm will correct the imbalance. This important aspect of movement is something you will never see in a stationary pose taken by a model, no matter how dynamic the pose is.

When drawing sequential movements from videos, you have the option of drawing the figure with or without clothes. Clothing can be interesting—twisting, turning, and flapping as it responds to the movement of the figure or to the force of gravity or wind. But clothing also obscures what is occurring in the structure, forcing you to try to "see through" the fabric to locate the shapes of the body. To do this, look for checkpoints: the general shape and placement of the rib cage and pelvis, the central axis of the torso, the shoulder and hip axes, the basic locations of the key joints (knee joints, elbow joints), and the various angles of the limbs.

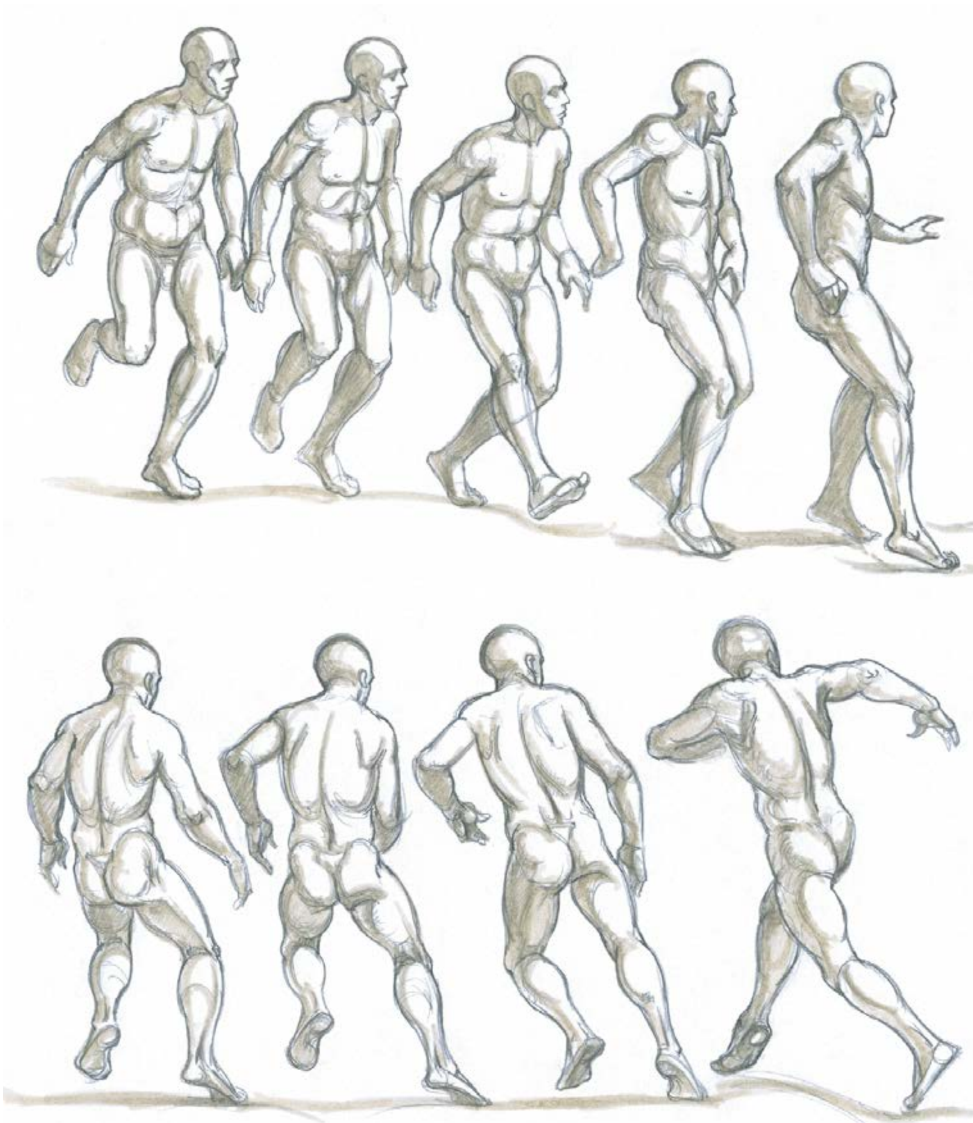
The following studies were done from video sources. Some were executed in a quick, loose manner and others were approached more methodically. *Quick Action Studies of a Soccer Player*, is a series of gesture studies, using a loose manikin approach, of a soccer player running toward the ball to kick it across the field. I included the red arrows when drawing to indicate key directional movements.



Graphite pencil (red marker for arrows) on white paper.

For the study *Soccer Player Changing Directions Mid-Stride,* below, I quickly drew a manikin of each position with graphite pencil and then later emphasized the anatomical contours with ballpoint pen for the lines and a warm gray marker for the tones. Since I wanted the drawing to be a simple study of the basic structure and anatomical forms, I drew the figure without clothes even though the player was wearing a typical soccer uniform.

SOCCER PLAYER CHANGING DIRECTIONS MID-STRIDE

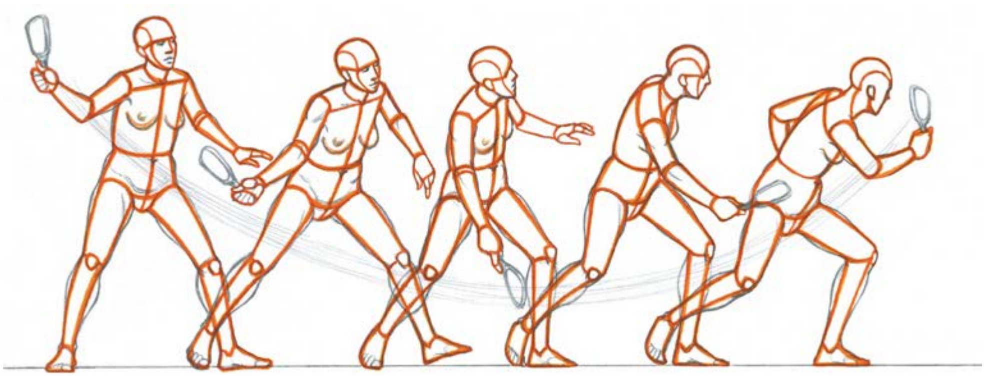


Ballpoint pen, graphite pencil, and marker pen on white paper.

In *Study of a Racquetball Player Doing a Forehand Stroke*, I drew the figure using the manikin approach, which helped define how the figure moved structurally. Indicating the structure in this very simple manner made it easier to see how the figure was leaning

and twisting and how the right arm created a dynamic arc.

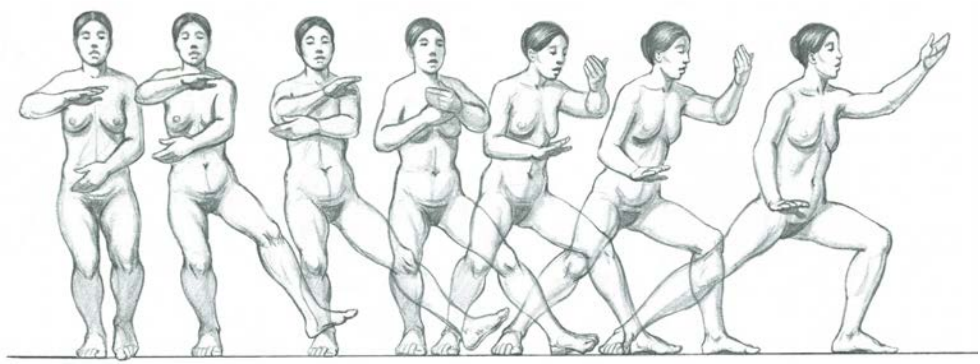
STUDY OF A RACQUETBALL PLAYER DOING A FOREHAND STROKE



Graphite pencil and colored markers on white paper.

Study of Tai Chi Movement, bottom, has a controlled feeling because of the slow tempo of the action. I blocked in each position very lightly, then drew the contours of the body with a very methodical line to keep the forms simple. I overlapped the individual positions slightly to underscore the shifting of weight that occurs during this slow-moving sequential action.

STUDY OF TAI CHI MOVEMENT



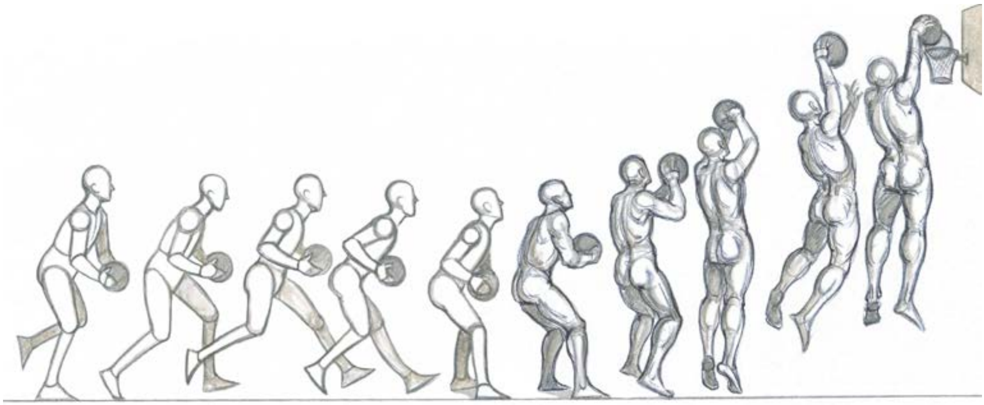
Graphite pencil on white paper.

In *Study of a Ballet Movement,* opposite, I emphasized the rhythmic shapes of the forms to bring out their organic, fluid quality. The rhythm of forms method works well when there is an obvious flowing energy to the overall movement. (Using the manikin approach might have made the figure look stiff.)

Graphite pencil, sepia pen, and watercolor pencil on toned paper.

Study of a Basketball Player Slam-Dunking a Ball Through a Hoop, opposite, combines actions: a horizontal running action and then a vertical jumping action. The figures were first drawn as basic manikins, and the last five drawings were fleshed out with anatomical forms.

STUDY OF A BASKETBALL PLAYER SLAM-DUNKING A BALL THROUGH A HOOP



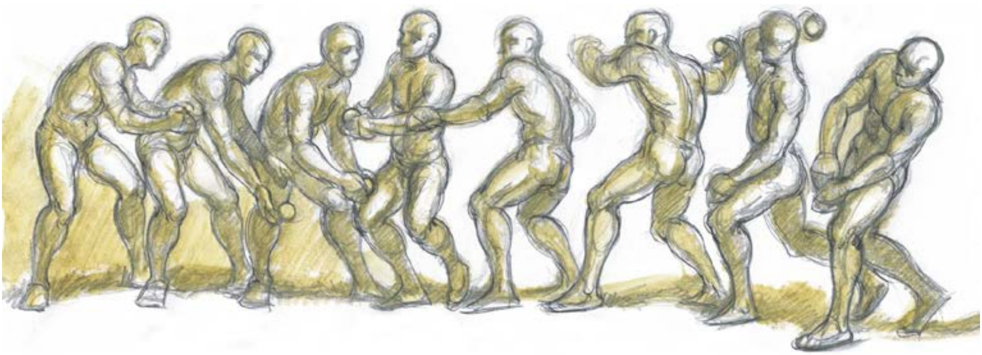
Graphite pencil, ballpoint pen, and marker on white paper,

Exercise #2: Working from Sequential Still Photographs

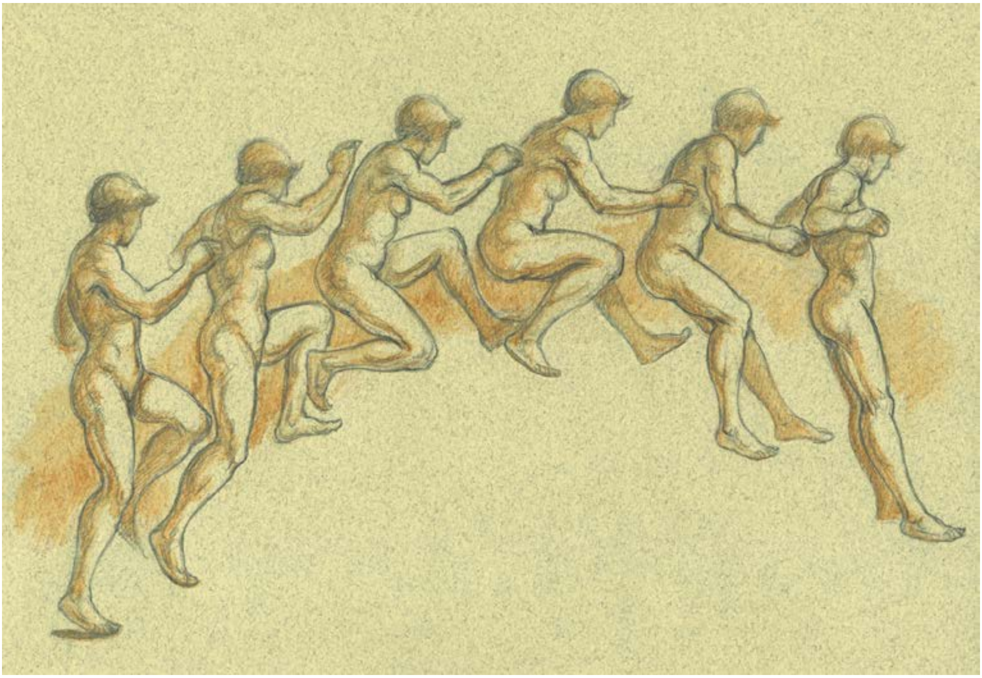
Another method for studying sequential movement is to draw from sequential stills selected or created by someone else. In some cases, the action of a figure has been filmed and key frames have been selected to illustrate moments in the sequence. In others, the action has been photographed with a digital camera with a rapid-firing shutter, producing a series of sequential stills with razor-sharp clarity. But stop-frame photography recording motion long predates the digital age. The photographs of Eadweard Muybridge (1830–1904), created in the late 1800s, depict sequential movements of animals and of human figures performing various tasks and actions. To this day, Muybridge's work fascinates artists who study figural movement, and you might also consider drawing from his photos, as I have done in the studies below.

A few Internet sites offer high-resolution photographs of sequential actions, and Muybridge's photos can be found on several websites (www.muybridge.org has an especially good collection) as well as in published volumes of his work. Again, you may do this exercise as a rapid gesture study or a more analytical study.

STUDY OF A MALE FIGURE CATCHING AND THROWING A BASEBALL



After Eadweard Muybridge, The Human Figure in Motion (1901). Graphite pencil, ballpoint pen, and watercolor pencil on white paper.



After Eadweard Muybridge, The Human Figure in Motion (1901). Graphite pencil and watercolor wash on toned paper.

Exercise #3: Superimposing Sequential Actions

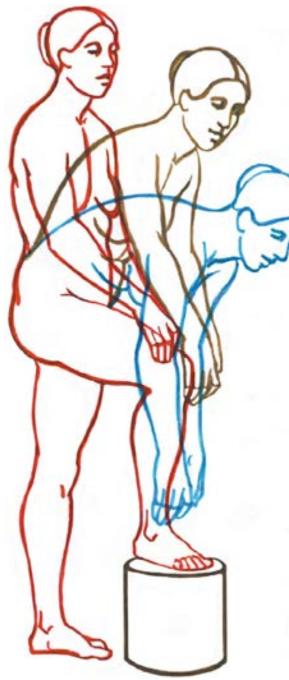
In this exercise, you superimpose the key positions of the action over one another. You can work from a model, from a video that you freeze-frame, or from sequential photographs. When working from a live model, have the model perform a very simple movement with one or both feet anchored in place. For example, the model could stand with feet planted on the floor, then slowly bend from the waist. Ask the model to execute the pose in three or four stages and to hold each position for thirty seconds to a minute. Instead of doing separate studies of each movement, superimpose your drawing of each successive key position on top of the first drawing. This exercise works best if you limit the layers to three or four. The superimposed layers can be drawn very lightly so that the overall drawing does not get cluttered with too many dark lines and tones. If you would like to embellish the layers, you can ask the model to repeat the same action again.

If a live model is not available, choose a video of a figure that remains standing or sitting while part of the body is moving. Freeze-frame the action at intervals, as you did in exercise #1. First draw the original pose, then superimpose each key position of the

movement on top of it. You may watch the sequence a few times for additional information, should you need it. Or you may enhance the drawings from memory.

In the study *Superimposed Movement—Woman Bending at Waist,* the model takes a standing pose with one leg on a supporting device, then bends at the waist in two positions. I've depicted the three positions in inks of different colors to distinguish them more clearly.

SUPERIMPOSED MOVEMENT—WOMAN BENDING AT WAIST



Graphite pencil and colored felt-tip pens on white paper.

Exercise #4: Capturing Continuous Movement

In this exercise, you draw from a live model who is executing a series of continuous movements on the model stand or on the floor, moving from one location to another. These movements should be performed in ultra-slow motion and in an improvisational, free-form fashion rather than according to a planned or choreographed sequence. Because the model does not pause, you should sketch each position for only a few seconds, continuously moving the drawing tool without lifting it from the surface of the page. You can connect the different stages of the movement with flowing lines or a series of rapid, angular strokes.

An alternative is to draw from a video of a dance sequence, yoga, or tai chi movement played in slow motion, as I did in the drawing on this page. Whether drawing from a live model or a slowed-down video sequence, draw continuously without any interruptions of the action.

Since the model is moving from one location to another, you should not try to

superimpose the movements on top of one another as in the previous exercise. Instead, rapidly move your drawing hand from one position on the page to the next, building a cluster of images moving across the page. Since you only have a split second to see a particular position, you will be drawing from very short-term memory before looking up to visually grab the next position. This exercise is challenging precisely because you do not have the opportunity to stop the model so that you can finish the sketch. The model will always be slowly moving to the next position and will not be able to repeat anything.

Although the end result will look very primitive, the exercise is a great way to let yourself go, not trying to produce a realistic interpretation but simply going with the flow of the continuous movement. It will help you build the skill of seeing a pose instantaneously and rapidly jotting down the pose before it flees from the mind—a very helpful skill when you're out sketching people in public.

STUDY OF A FIGURE PERFORMING A CONTINUOUS TAI CHI MOVEMENT

Felt-tip pen on white paper.

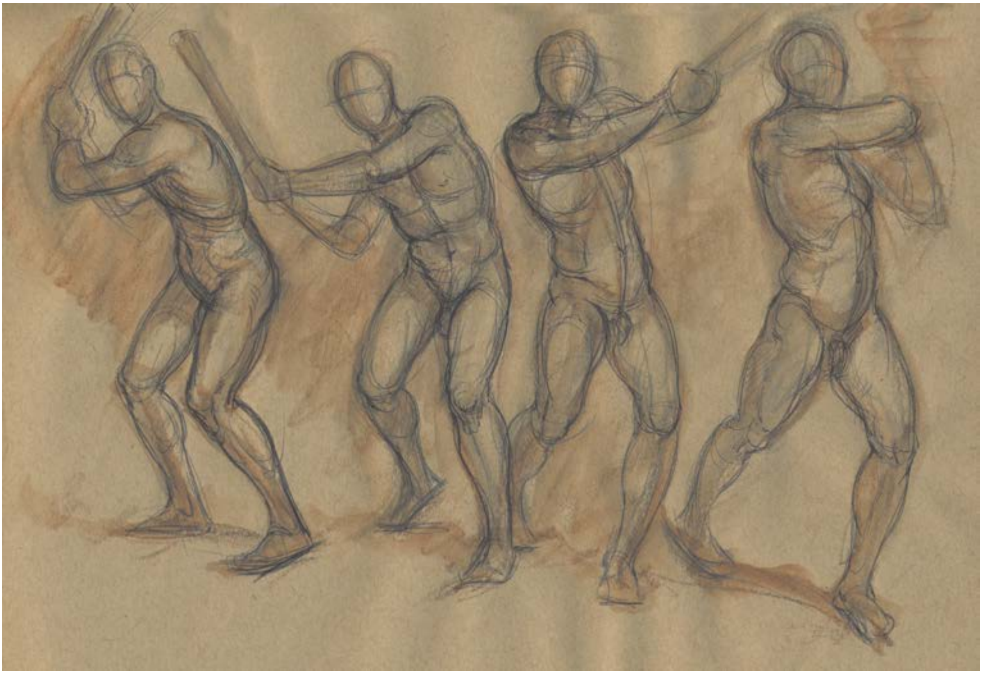
Exercise #5: Capturing Basic Positions of a Choreographed Movement

This exercise requires that you work from a live model. Ask the model to perform a continuous action (such as swinging a baseball bat) and then to break it down into three to five basic positions. Then the model should take those positions sequentially, holding each for two to five minutes while you draw. (Alternately, you can take photos of the key positions and practice drawing them after the session.) Since the action is planned, or choreographed, the positions may appear slightly stiff because they are all in the safety zone of equilibrium. To counter this stiffness, try slightly exaggerating the joint movements or applying a continuous tone in the background, connecting the figures together.

Study of a Figure Hitting a Baseball, opposite, is an example of a choreographed

sequential movement drawn from a model who held each of the four positions for a short interval. Because of the short duration of each pose, I approached the drawing as a gesture study. I used a graphite pencil to sketch the initial shape of each pose, then embellished it using a ballpoint pen. The watercolor wash was added afterward.

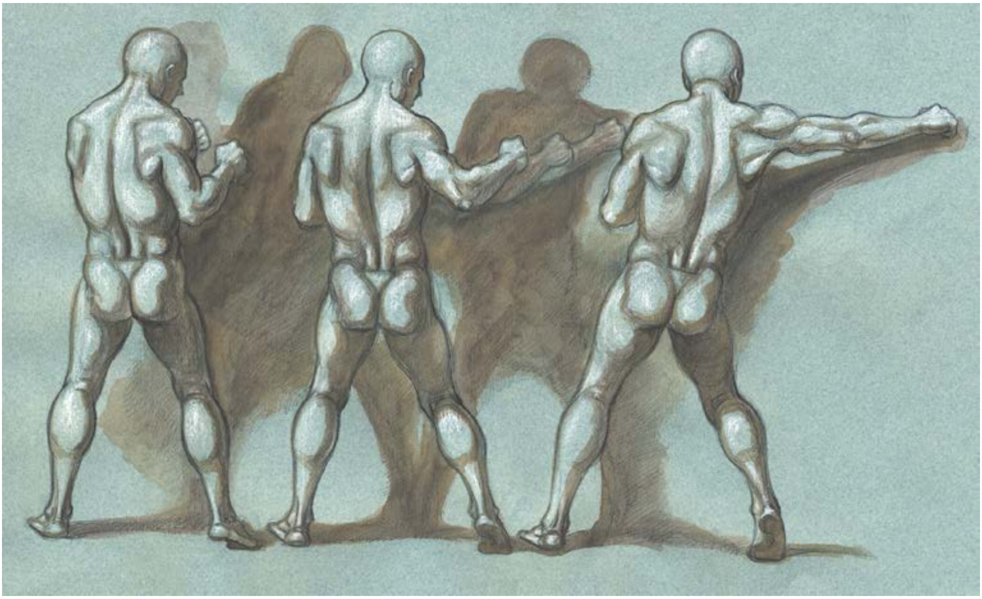
STUDY OF A FIGURE HITTING A BASEBALL



Graphite pencil, ballpoint pen, and watercolor wash on toned paper.

In *Study of a Figure Throwing a Punch—Posterior View,* the model took three key positions in a punching action, and I took photographs of each. Since drawing from photos of a choreographed action tends to look a bit stiff or artificial, I decided to approach the drawing as an anatomical study rather than a gesture study and to focus on the dynamic muscles within each position. The large shadows in the background help connect the figures. I decided as an afterthought to add the multiple images of the middle figure's forearm to foreshadow the upcoming punch, fully seen in the figure on the right.

STUDY OF A FIGURE THROWING A PUNCH—POSTERIOR VIEW



Graphite pencil, ballpoint pen, sepia ink wash, and white chalk on toned paper.

Exercise #6: Capturing Action/Reaction Poses

The action/reaction exercise requires two models. One strikes an action pose and the other reacts to it, both holding their poses for about five minutes. The time is purposely kept short so that the models can manage difficult poses. This exercise is challenging not just because it's so brief—you'll have only two and a half minutes to work on each figure—but because you'll also want to consider the space the models are occupying and perhaps to give the drawing a narrative or emotional overtone.

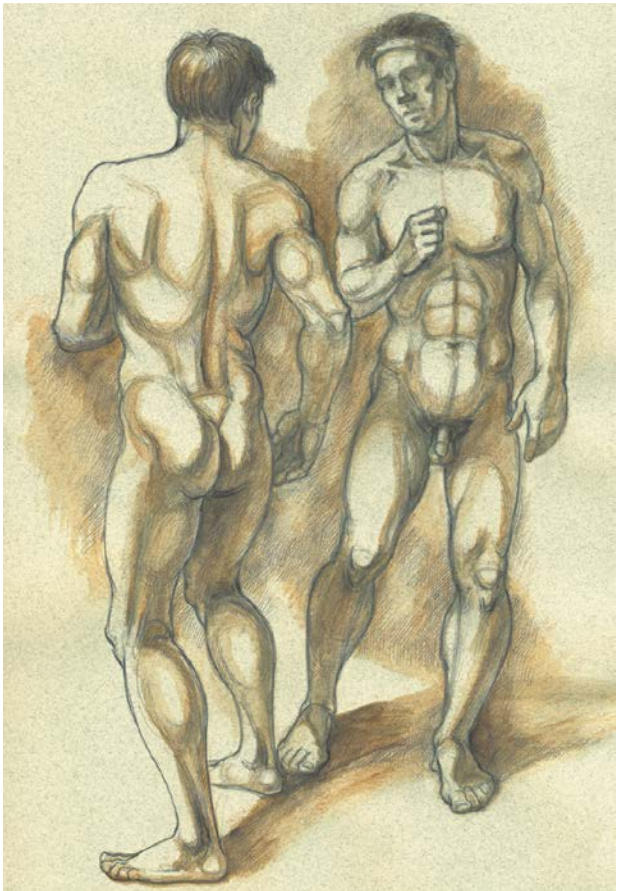
The models can be nude or in limited costume (so as not to block too much of the structure), and you might even give them stage props (such as swords) to evoke a feeling of narrative or storytelling. The models can plan the poses or perform the actions spontaneously. In either case, ensure that there is a flow of dynamic energy between the figures by asking the models to take poses with lots of action (twists, arcs, dynamic angles) and to pose in different directions—for example, with one person standing as the other bends or with both arcing away from each other.

Although you are not capturing a sequential action in this exercise, it could certainly be extended to a series of related action/reaction poses. A single action/reaction configuration could also be extended for a longer time, though the models will not be

able to hold such dynamic poses. Still, it's always a challenge to convey a feeling of continuity between two figures, even when the action/reaction pose is comparatively passive.

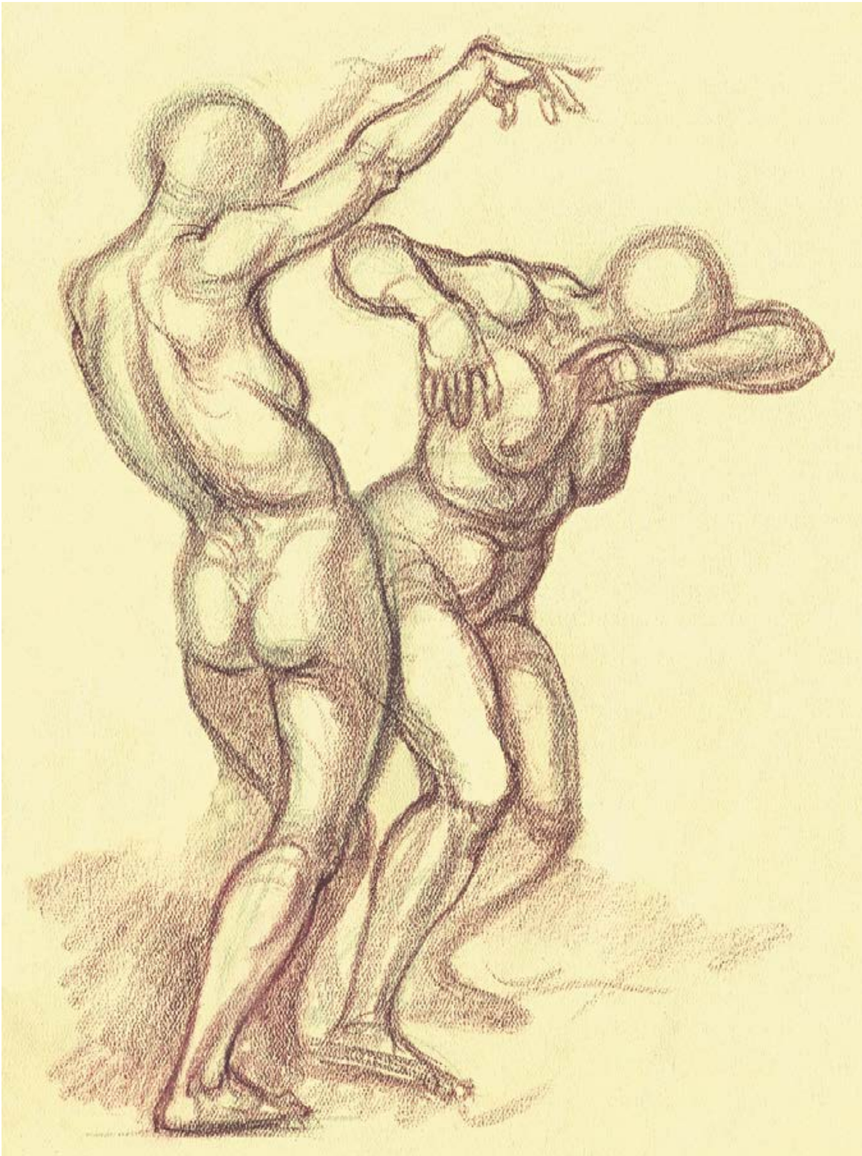
If you cannot get access to two models at once, there are alternatives: One is to draw from a photo of two figures—boxers, dancers, fencers—interacting, whether subtly or in a dynamic way. Another is to use two figures from a video of a swordfight, martial arts sequence, dance performance, or wrestling or boxing match. Just freeze-frame an interesting angle of the two figures interacting and draw. Or you might select figures from two unrelated photos that you think might be convincingly placed together. Do thumbnails of different ways of arranging these figures on the page, and consider overlapping the forms, making them different sizes, or suggesting an environment or background in the drawing. Finally, you might go through your old gesture drawings and select two poses that you think would work together. Again, do thumbnails combining the figures in different arrangements; once you have a good pose, draw a slightly more detailed version of it on another sheet of paper.

In *Study of Two Male Figures Acting and Reacting,* shown next, I worked from two different gesture studies, placing the figures together on a light toned paper. I then decided to treat this as a longer study so that I could focus on the anatomical forms.



Graphite pencil, ballpoint pen, brown pen, and sepia ink wash on light toned paper.

In *Study of Two Female Figures in Action and Reaction Poses,* I drew from two models who were doing short poses together. I tried to capture the narrative aspect of their actions by emphasizing their body language (one figure dominating, one figure reacting in a frightened manner). Animators would naturally exaggerate this type of action into a much more obvious storytelling scenario.



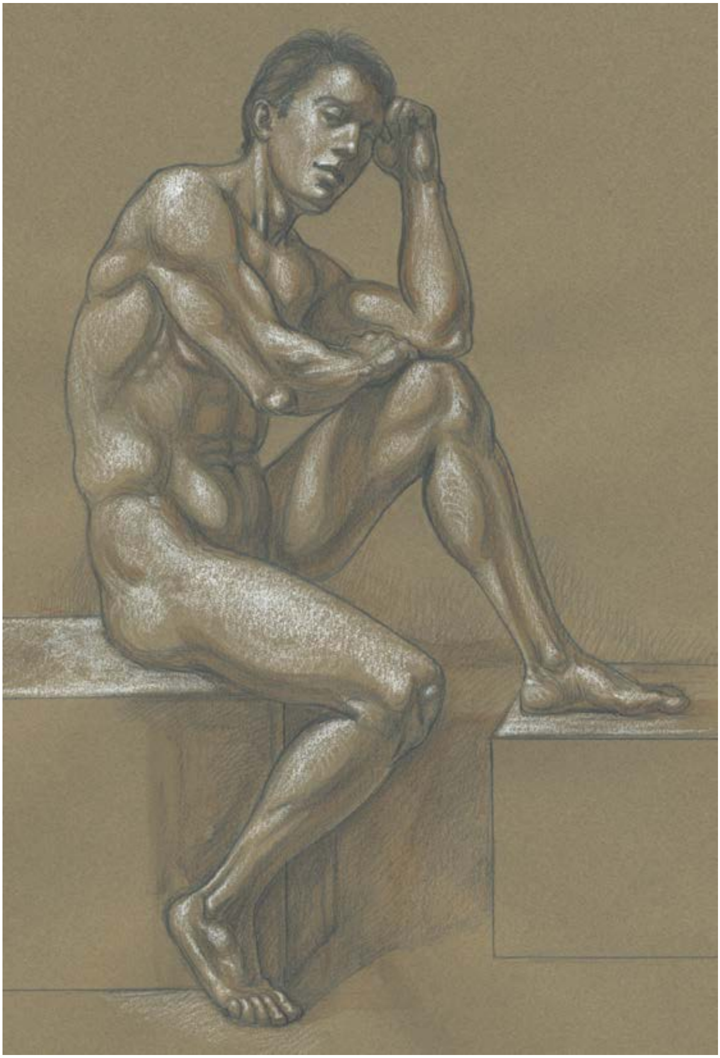
Graphite pencil and colored pencil on light toned paper.

In *Five-Minute Study of Two Models in Costume Interacting,* shown next, I wanted to convey the dynamic energy between the models via a very loose gestural approach. By

putting models in costume and equipping them with props, you open endless possibilities for action/reaction poses.

FIVE-MINUTE STUDY OF TWO MODELS IN COSTUME INTERACTING

Black Conté crayon on newsprint.



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ABOUT THE AUTHOR/ARTIST

Valerie L. Winslow is a professional fine artist who has exhibited her paintings, drawings, and low-relief sculptures in museums and galleries nationwide since 1977. Works by her are in many private collections, and she has won numerous museum awards.

Winslow's first book, *Classic Human Anatomy: The Artist's Guide to Form, Function, and Movement* (Watson-Guptill, 2009), containing hundreds of drawings, has received worldwide recognition. *Library Journal* hailed it as a significant contribution to the literature of art reference. The present book continues her exploration of anatomy in relation to the movement of the human figure.

Since 1979 Winslow has taught figurative art and artistic anatomy at well-known institutions including the Art Center College of Design in Pasadena, California; California Institute of the Arts (CalArts) in Valencia, California; and San Francisco's Academy of Art University, where she serves as anatomy coordinator for the AAU School of Fine Arts. She also taught artistic anatomy to animators at Pixar Animation Studios.

For more information on the artist and to view a portfolio of her work, visit *valerielwinslow.com*.

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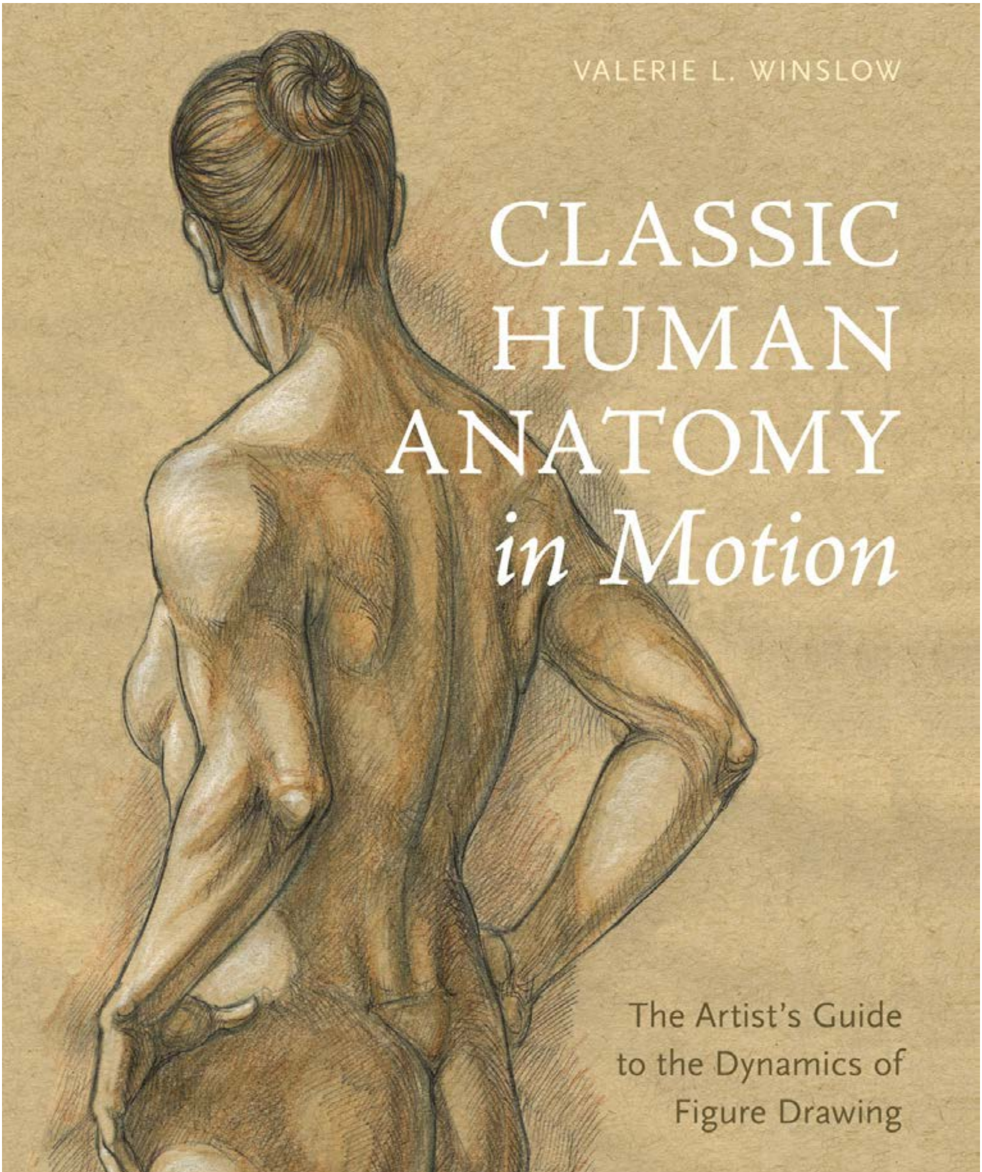
VALERIE L. WINSLOW
CLASSIC HUMAN ANATOMY in Motion
The Artist's Guide to the Dynamics of Figure Drawing